(2)

US Army Corps
of Engineers

The Hydrologic
Engineering Center

GENERALIZED COMPUTER PROGRAM

HEC-3

Reservoir System Analysis for Conservation

Users Manual

March 1981

Computer Program 723-030

HEC-3

Reservoir System Analysis for Conservation

Users Manual

March 1981

US Army Corps of Engineers
Water Resources Support Center

The Hydrologic Engineering Center
609 Second Street
Davis, California 95616

FOREWORD

This program was originally issued in December 1968. Since then it has undergone several revisions to make it more efficient and useful. The most recent revision has been to restructure the input data requirements to improve input preparation. Earlier revisions have been retained, and in some cases improved. The program is primarily used to simulate reservoir systems for conservation purposes. Other Hydrologic Engineering Center programs are available to simulate other hydrologic aspects of a system - HEC-1 for rainfall-runoff modeling; HEC-2 for modeling stream channel hydraulics; HEC-5 for flood control systems analysis.

HEC-3
RESERVOIR SYSTEM ANALYSIS FOR CONSERVATION

THE HYDROLOGIC ENGINEERING CENTER
COMPUTER PROGRAM 723-X6-L2030

CONTENTS

CONTENTS

HEC-3
RESERVOIR SYSTEM ANALYSIS FOR CONSERVATION

THE HYDROLOGIC ENGINEERING CENTER
COMPUTER PROGRAM 723-X6-L2030

1. ORIGIN OF PROGRAM

This program is the fourth generation of a program originally developed in 1965-1966 at The Hydrologic Engineering Center by Mr. Leo R. Beard. Since the initial version was issued many modifications have been made to increase the capability of the program, and the program has undergone extensive testing. The primary modification incorporated into the version described herein is a complete revision of the input structure. The primary purposes of modifying the input structure were to simplify input preparation and to facilitate changes in input required for sensitivity studies and studies of alternative system configurations.

2. PURPOSE OF PROGRAM

The program simulates the operation of a reservoir system for such conservation purposes as water supply, navigation, recreation, low-flow augmentation and hydroelectric power. While flood control operations can be handled in some respects, a more complete simulation is possible using HEC-5 "Reservoir System Operation for Flood Control." The program can accept any configuration of reservoirs, diversions, powerplants and stream control points. Economic values can be computed for meeting selected targets.

3. DESCRIPTION OF EQUIPMENT

The program was designed for use on a large computer such as the CDC 6600, Honeywell 625 or IBM 360/50. It can be used on medium-sized computers such as the Honeywell 400, but the size of the system that can be studied is reduced and the run times may be considerably longer. Four magnetic tape units or other file devices are required in addition to input and output files.

4. DESCRIPTION OF PROGRAM

a. System Components.

(1) There are five basic system components which are used by the program to model a reservoir system. These are the system hydrology,

reservoirs, control points, powerplants and diversions. To capture the essence of the real system it is necessary to describe each component, quantitatively or mathematically, in sufficient detail. In the sections which follow important characteristics of each component are discussed. Interrelationships between components are discussed under system operation.

b. Hydrologic Characteristics.

(1) Inflows. The system inflows are the primary hydrologic component of the program. To describe the inflow it is necessary to identify the location, i.e., control point where they occur, their magnitude and the time period when they occur. This time period is described by specifying the number of years of data, the number of periods per year and number of days per period. In most cases the time interval is taken to be a month, thus the simulation usually performs a monthly routing of flows.

(2) Local Flows. Incremental local flows are flows which are equal to the difference between inflows at adjacent control points. Cumulative local flows are equal to the difference between the inflows at a certain control point and the inflows from all reservoirs immediately above that control point such that if the above reservoir releases are added to the cumulative local flow the resulting flow would be the regulated flow.

(3) Evaporation. Reservoir evaporation is an important part of the system's water balance computation and is input into the model by specifying a net evaporation rate (difference between evaporation and rainfall) for each reservoir. This rate may be made the same for all reservoirs and all years, varied by time period, or varied by reservoir.

c. Reservoir Characteristics.

(1) Elevation, Storage, Surface Area, Outlet Capacity. These characteristics describe important physical features of each reservoir and are necessary to model the storage and release features of the reservoir. For a particular reservoir, each reservoir elevation has associated with it a specific storage capacity, surface area and outlet capacity. Leakage through or under a dam or powerhouse may also be specified.

(2) Operating Criteria. To simulate the operation of a reservoir system the operating criteria must be expressed in quantitative or mathematical terms. The primary mechanism for doing this is by dividing the reservoir into imaginary horizontal levels. Corresponding to each level is a reservoir elevation, storage, surface area and outlet capacity.

Differences between levels are zones of potential storage volume. The lowest level corresponds to the bottom of the conservation pool (top of inactive pool), the second lowest level is the top of the buffer zone, the highest level is the full pool level (top of flood control), and the second highest level is the top of conservation (bottom of flood control). Additional levels can be established to facilitate individual reservoir operating criteria.

Each reservoir is operated to meet streamflow targets at specified locations in the system. These operational points are specified for each reservoir by identifying those points for which the reservoir does not operate. Priority of withdrawals from reservoirs serving the same location can be established by specifying additional levels. The highest storage zone is withdrawn from first, then the second highest and so on down to the lowest keeping all reservoirs in the system in balance to the extent possible. A numerical example of this leveling technique appears in exhibit 1.

Other operating criteria specified in the model are initial reservoir storage and spillway surcharge. An initial storage must be specified to begin the simulation. This may be an actual or assumed value. During flood operations inflow causing a reservoir to rise above its top of flood control level must be either spilled or stored in surcharge storage. Water spilled may be released into the stream below the reservoir or to a diversion if one exists. The other alternative is to specify that the excess be stored in surcharge storage.

(3) Hydrologic Balance. Computations in the model are based on the principle of continuity as expressed by the equation

$$S_i = S_{i-1} + I_i - Q_i - E_i$$

where,

S_i = reservoir storage volume at the end of the current period, i

S_{i-1} = reservoir storage volume at the end of the previous period, i-1

I_i = inflow volume during period i

Q_i = release volume during period i

and E_i = net evaporation volume during period i

This basic equation, when I, Q, and E are properly defined, is appropriate for storage accounting where the length of the period i is long compared to the travel time through the reservoir. It should be noted that proper definition of I implies that all diversions into the reservoir and releases from upstream reservoirs must be added to the natural inflow to obtain the inflow volume; that proper definition of Q implies that all diversions out

of the reservoir, leakage from the reservoir, and releases for different purposes are added together to obtain the total release volume; and that E must reflect the gain or loss in reservoir storage volume that would occur as a result of net evaporation (evaporation minus precipitation) over the impoundment area during the period.

d. Control Point Characteristics.

(1) Control points, which are not reservoirs, are used to regulate system operation by establishing constraints and targets on streamflow. Both reservoirs and selected locations along the stream network are assigned control point numbers. There are three types of controls which may be specified for any stream control point: maximum permissible flow, minimum desired flow, minimum required flow. Maximum permissible flow places an upper limit on the desired magnitude of the streamflow at the selected point. This limit is maintained unless upstream reservoir flood control storage is exceeded and operation requires spilling excess water. Minimum desired flow is a target flow which is sought while reservoirs are operating in the conservation pool above the top of buffer zone. When the reservoir levels go into the buffer zone the minimum required flow becomes the target. Each flow requirement may be constant, or vary for each period.

Each control point is assigned both a number and name and those reservoirs in the system which will operate to meet the target flows of that control point are identified.

e. Powerplant Characteristics.

(1) Power calculations are based on the equation

$$GE_i = K\, Q_i \cdot h_i \cdot e_i \cdot t$$

where,

K = .08464 for English units, 9.817 for Metric units

GE_i = energy in kilowatt-hours generated during period i

Q_i = average flow in cfs (m^3/sec) through the generating units during period i

h_i = average effective head in feet (meters) on the turbine during period i

e_i = efficiency of the generating units during period i

t = hours in period i

This equation is appropriate for use when Q_i has been defined as only that part of the release volume which passes through the generating units, when h_i is defined as the head which exists during the period i (calculated by

subtracting tailwater elevation and head loss from the reservoir surface elevation), and when e_i reflects the average overall station efficiency during period i. The calculation of head is based on the elevation corresponding to mean reservoir storage for the current period (average of the beginning and ending reservoir storage) and the tailwater elevation is specified as either a constant value, or a function of the mean release rate for the period, or a function of the pool elevation of a downstream reservoir.

(2) Powerplant characteristics which are used in the model to simulate power operations include,

- installed powerplant nameplate capacity
- maximum plant factor for generation
- powerplant efficiency
- tailwater elevation plus hydraulic loss
- overload ratio for the power installation
- power load requirements for each plant for each time period

In addition several functional relationships are sometimes necessary for reservoir operation and power production. These include,

- power releases vs. power tailwater elevation
- maximum peaking capability vs. reservoir storage or reservoir release
- powerplant efficiency vs. reservoir storage

f. Diversions. One diversion may exist at any control point, and may be specified as the actual flow diverted, or as a function of the natural flow, regulated flow, or reservoir storage. Diversion requirements may be specified constant for each period, or varied each year. A diversion can also be used to accommodate flood flow above the top of flood control pool.

g. Economic Evaluation.

(1) An economic analysis of the system operation is available at each control point by specifying a functional relationship between a hydrologic quantity such as streamflow, reservoir storage, power generation and the economic value of meeting these hydrologic quantities during a given time period, normally a month. A different economic function may be specified for each purpose. Thus, at each control point, for each purpose and for each time period the program will compute the economic value of the particular hydrologic quantity and sum these over the period of analysis.

(2) The net economic gain between a preproject (natural) system and one with projects is measured by determining the economic value using unregulated flows and regulated flows and the specified economic function.

This will give the gain of the system as a whole. The contribution of any one project is best measured by simulating the operation of the system with and without that project. An alternative approach is available in the program which assigns economic values to upstream reservoirs. Using this approach, the difference between project and preproject economic values are allocated in direct proportion to the change in storage at the various upstream reservoirs. When a reservoir has a change in storage which is opposite in sign to the net change of all upstream reservoirs operating for that control point, an economic contribution of zero is assigned to that particular reservoir.

h. System Operation.

(1) The simulation model operates by considering the water and power requirements at each pertinent control point in the system in a sequential fashion, beginning at an upstream point and moving in a downstream direction through each river basin. The release required to meet these requirements for all pertinent purposes is determined by evaluating each operational requirement and all physical and operational constraints at each site. Also, an index of the relative state of each reservoir (usually a function of reservoir storage) is determined according to the specified operation guides. After requirements have been met at all control points (or shortages declared if upstream water is not available), "system requirements" are examined to determine whether additional water releases or power generation will be needed to satisfy the system power demands. If so, the additional needs are proportioned among projects that have been specified to be available for meeting that system requirement in accordance with the relative state of the projects as evidenced by the indices previously computed. The additional releases are added to the previously computed releases for meeting at-site requirements, and the system and at-site requirements are thus met (or system and at-site shortages are declared if water is not available). This process is repeated for each period of the study, with the ending state of the projects in the system for the current period being the beginning state for the next period.

(2) Results from the successive applications of these calculations on a period-by-period basis are recorded for all points in the system (including nonreservoirs) by an accounting procedure which simply accounts for the movement of the water through the system by using the specified relative location of the reservoirs and downstream control points. By adding releases to local streamflow to obtain total streamflow, and by adding inflows to storage volume and subtracting releases from storage volumes the state of any component and the flow at any point in the system can be calculated. As these results are calculated they are stored and finally printed out, normally a year at a time on a project-by-project basis, to produce a continuous record of inflow, storage, outflow, power

generation, and other pertinent data. These results may be automatically rearranged in many ways to serve various needs in analysis or evaluation of the system operation.

(3) System power. Where many powerplants are included in one system, it is often desirable to specify requirements for the system as a whole as well as minimum requirements for each plant. When system requirements are specified, it is also necessary to specify, for each plant, the maximum generation usable in meeting system requirements. The maximum is usually specified as a plant factor.

During the first search of the system, the minimum power requirement at each plant will be established, and the total generation during the period at each plant will be computed. This total can exceed the minimum required generation if other services call for additional releases from the particular reservoir.

At the end of the first search, a summary is made of the total power generated and required and of the total power generated and usable to satisfy system requirements. If the system requirement has not been satisfied, water levels at those reservoirs where additional generated power could be usable for meeting system requirements would then be drawn toward a common storage-balancing level such that the full system requirement is generated. The allocated system requirements are then used in making a second search of the entire system for all purposes.

Since satisfying these additional requirements will usually change releases at many reservoirs, the average head during the second search will be different from the average obtained from the first search and used in the second search. Accordingly, accurate system power (and evaporation) computations require a third complete search of the entire water resource system for each operation period.

5. INPUT

Input data preparation is described in detail in exhibit 4. Example problems illustrating input preparation are shown in exhibit 2.

6. OUTPUT

Numerous options are available for data output and these are described in exhibit 4 on input preparation. Exhibit 3 contains a detailed description of output data and exhibit 2 shows output for the example problems.

7. BIBLIOGRAPHY

The following publications describe simulation model applications and related subjects for a variety of reservoir systems and purposes. They are available upon request from The Hydrologic Engineering Center.

(1) Proceedings of a Seminar on Reservoir Systems Analysis, The Hydrologic Engineering Center, 4-6 November 1969.
Contents include,

- Status and Potential of Reservoir System Analysis
- Flexibility in Water Resources Management as Related to Reservoirs
- Flood Regulation of Kansas River Basin Reservoir
- Operation Studies of the Kaskaskia River Reservoir System
- System Operation of Reservoirs on the Apalachicola River
- Reservoir Operation for Conservation on Roanoke River
- Comparison of Pre-construction and Post-construction Reservoir Regulations
- Reservoir Systems Analysis in the San Francisco District
- System Analysis for Regional Water Supply Planning The Northeast Water Supply Study
- System Analysis as a Basis for Planning Columbia Basin Projects
- Planning Studies for the Minnesota River Basin
- Arkansas-White-Red Rivers Reservoir System Conservation Studies
- Application of System Analysis Techniques to Project Operations
- Integrated System Analysis for Multi-Annual Regulation Studies, Missouri River Main Stem Reservoir System
- Annual and Short-Range Operation Plans, Missouri River Main Stem Reservoir System
- Operating Reservoirs in System Simulation by an Iterative Technique

(2) A Hydrologic Water Resource System Modeling Technique by L.G. Hulman and D. K. Erickson, Technical Paper No. 16, The Hydrologic Engineering Center, 1969.

(3) Uses of Simulation in River Basin Planning by William K. Johnson and E. T. McGee, Technical Paper No. 23, The Hydrologic Engineering Center, August 1970.

(4) Hydroelectric Power Analysis in Reservoir Systems by Augustine J. Fredrich, Technical Paper No. 24, The Hydrologic Engineering Center, August 1970.

(5) Status of Water Resource Systems Analysis by Leo R. Beard, Technical Paper No. 25, The Hydrologic Engineering Center, January 1971.

(6) System Relationships for Panama Canal Water Supply Study by Lewis G. Hulman, Technical Paper No. 26, The Hydrologic Engineering Center, April 1971.

(7) Systems Analysis of the Panama Canal Water Supply by David C. Lewis and Leo R. Beard, Technical Paper No. 27, The Hydrologic Engineering Center, April 1971.

(8) Digital Simulation of an Existing Water Resources System by Augustine J. Fredrich, Technical Paper No. 28, The Hydrologic Engineering Center, October 1971.

(9) Development of System Operation Rules for an Existing System by Simulation by C. Pat Davis and Augustine J. Fredrich, Technical Paper No. 31, The Hydrologic Engineering Center, August 1971.

(10) System Simulation for Integrated use of Hydroelectric and Thermal Power Generation by Augustine J. Fredrich and Leo R. Beard, Technical Paper No. 33, The Hydrologic Engineering Center, October 1972.

(11) Reservoir Storage-Yield Procedures, Methods Systemization Manual, The Hydrologic Engineering Center, May 1967.

APPENDIX I

IFLOW ROUTINE

The IFLOW routine permits the user to automatically determine the firm yield for water supply at one control point in a reservoir system. To use this program capability, the identification number of the control point is entered in field 8 of the J1 card and an estimate of the firm yield is entered as QMN (ID.2), on QD cards, or on YQ cards. The program executes a normal routine sequence with the historic flow data supplied. If the desired flow at the control point in question is not met, the water shortage index is used to calculate a reduction coefficient which is used to set a new, lower desired flow. If the desired flow is met with no shortage, the storage remaining in the conservation pools of the reservoirs serving the control point of interest is used to calculate an increase coefficient which is used to set a new, higher desired flow. The program then executes a second routing sequence with the same system and hydrologic data. The desired flow at the control point under study is checked again. If the previously calculated quantity is not obtained without shortage or storage remaining in the reservoirs, a further revision of the desired flow is calculated. Through a series of approximations, the firm yield is finally determined. The initial estimate may be either too high or too low and the program will automatically raise or lower the value to converge on the firm yield. All printout is suppressed during the routing sequences with approximate values and only the routing with the desired flow equal to firm yield is printed.

APPENDIX II

IDVSP ROUTINE

The IDVSP option permits the user to determine and to reroute the flood flows occurring at a reservoir or a control point. For this purpose, flood flows are considered to be any flow or reservoir release in excess of the specified maximum channel capacity or outlet capacity. When the value of IDVSP, field 5 of the J1 card, is positive, the option will operate at all control points having a diversion specified in the system configuration. The flows at each control point having a diversion are checked against channel capacity or outlet capacity at that point, and the flow quantities in excess of capacity are added to the diversion at that point. The quantities of water added to the diversion may be determined from the printed routing or from the rearranged diversion data for the control point. The flow spilled through the diversion may be added to another reservoir or control point in the system by specifying a return flow diversion at the second control point. This feature is useful in studies involving inter-basin transfer and storage of excess flows for conservation purposes, as well as in studies involving diversion of flood flows through bypasses or into adjacent river channels.

EXHIBIT 1

SPECIFYING RESERVOIR OPERATING RULES USING RESERVOIR LEVELS

HEC-3

RESERVOIR SYSTEM ANALYSIS FOR CONSERVATION

Release priorities between reservoirs are an important reservoir operating criterion which must be specified for most system operations. To illustrate the technique used in computer program HEC-3 and HEC-5, the following example has been prepared. Assume the information shown below in Table 1 is known for each of four reservoirs which constitute a reservoir system. Figure 1 shows the various reservoir levels graphically.

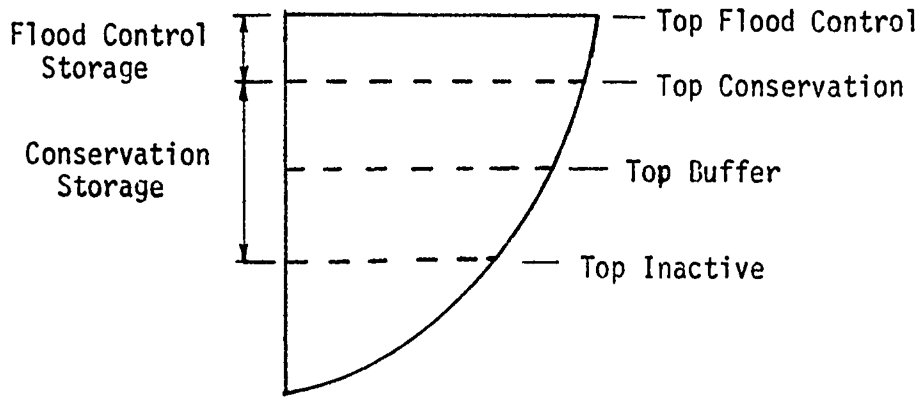
TABLE 1

Reservoir Storage Levels

Reservoir Number	Storages, Cumulative (ac-ft) Top Inactive	Top Buffer	Top Cons	Top FC
1	1,000	5,000	50,000	100,000
2	5,000	10,000	100,000	200,000
3	10,000	20,000	150,000	500,000
4	50,000	100,000	200,000	700,000

FIGURE 1

Reservoir Storage Levels



It is desired to operate this system according to the following:

1. Release all flood control storage to maintain the same degree of risk.

2. Release reservoir 1 conservation storage above top of buffer, first.

3. Next release reservoirs 2 and 3 conservation storage above top of buffer.

4. Next release reservoir 4 conservation storage above top of buffer.

5. Release conservation storage below top of buffer equally.

To specify these operating criteria in HEC-3 and HEC-5, each storage level in each reservoir is assigned an integer number from 1 to a maximum of 8. The number of levels used is the minimum number required to specify the desired operating rules. In this example, six levels were found to be necessary. The lowest level, level 1, corresponds to the top of inactive pool; the highest level, level 6, corresponds to the top of flood control pool; see Table 2. The computer program makes releases from storage between the highest and next highest level until the water stored between these levels is exhausted, then it goes to the next lower level, and so on in descending order. All reservoirs with storage between the same successive pair of levels make releases where possible to maintain the same degree of risk. The specific criteria depends upon the system configuration.

Levels 2 through 5, in this example, are assigned in such a way that the system operates as desired. Since operating rule 1 desires that all reservoirs release from flood control storage equally, by assigning level 5 to the top of conservation (bottom of flood control) for all reservoirs this rule is achieved. Operating rule 2 desires that all conservation storage from reservoir 1, above top of buffer, be released first. By assigning level 4 to the top of buffer for reservoir 1, and top of conservation for all other reservoirs, this rule is achieved. This limits the available storage between levels 4 and 5 to the conservation storage in reservoir 1, thus it will be exhausted before water is released below level 4. Operating rule 3 is achieved in a simmlar manner, by assigning level 3 to the top of buffer for reservoirs 2 and 3 and to the top of conservation for reservoir 4. Conservation storage volume is provided between levels 3 and 4 for reservoirs 2 and 3, but not for reservoirs 1 and 4. Lastly, level 2 is assigned to the top of buffer for all reservoirs. This meets rule 4 since reservoir 4 is the only

reservoir with storage volume between levels 2 and 3. Below the top of buffer all reservoirs are to release equally. This is achieved since level 2 for all reservoirs is the top of buffer.

TABLE 2

Assigned Storage Levels

Level	Res 1	Res 2	Res 3	Res 4
6	100,000	200,000	500,000	700,000
5	50,000	100,000	150,000	200,000
4	5,000	100,000	150,000	200,000
3	5,000	10,000	20,000	200,000
2	5,000	10,000	20,000	100,000
1	1,000	5,000	10,000	50,000

To summarize, Figure 2 shows the level numbers assigned to each reservoir level for each reservoir. These numbers and corresponding reservoir storage volumes are specified as input on the RL card. During simulation the system operates as follows: any water stored between levels 5 and 6 is released from each reservoir; when the water stored between levels 5 and 6 has all been released, water between levels 4 and 5 is released - in this example only reservoir 1 has a storage volume between these levels; when the volume stored between 4 and 5 is exhausted, releases are made from storage between levels 3 and 4, this means from reservoirs 2 and 3; next storage between levels 2 and 3 is exhausted, hence, releases are made from reservoir 4; and lastly storage between levels 1 and 2 is released. This technique for specifying reservoir operating rules has proved to be an effective way to handle most operating criteria.

FIGURE 2

Reservoir System Priority of Operation

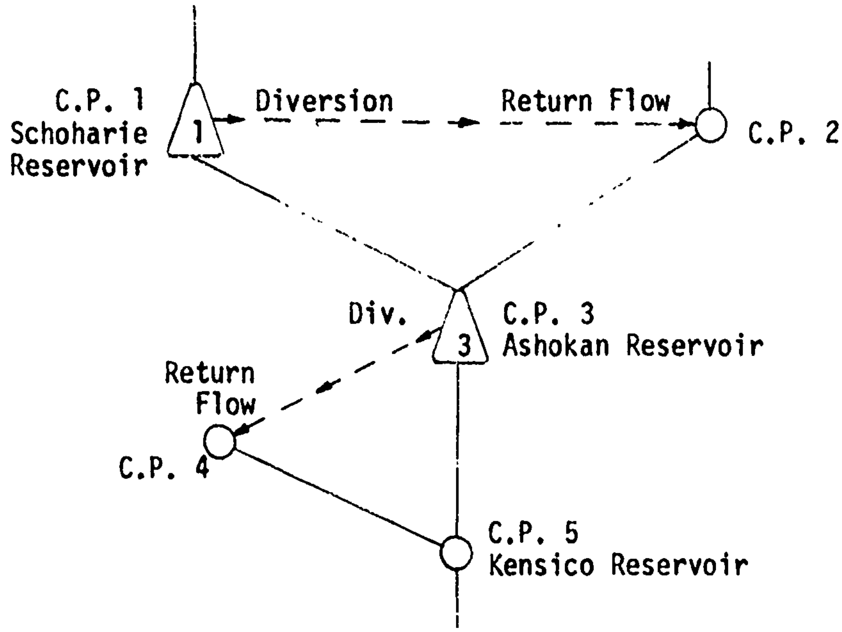
Level	Res 1	Res 2	Res 3	Res 4
Top of Flood Control	——— 6	——— 6	——— 6	——— 6
Top of Conservation	——— 5	——— 4,5	——— 4,5	——— 3,4,5
Top of Buffer	——— 2,3,4	——— 2,3	——— 2,3	——— 2
Top of Inactive	——— 1	——— 1	——— 1	——— 1

EXHIBIT 2

TEST DATA 1 - DESCRIPTION

General

These test data illustrate the use of this program in simulating the operation of a two-reservoir system to meet downstream flow and diversion requirements.



Hydrologic Data

Average monthly evaporation was obtained for the basin and input on the J8 card. The monthly value was applied to each reservoir by specifying the ratio CEVAP (R1 card, field 1) equal to 1.0.

Streamflow information was available at only one gaging station (6) in the basin; therefore, it was necessary to use drainage area ratios to compute the local (flow below upstream reservoir and control point) monthly flows at each control point by use of the LF card.

Control Point	Ratio to Flow Station 6	Remarks
1	1.330	Inflow to Schoharie Reservoir
2	0.	Receives diversion from CP No. 1; no local flow.
3	1.09	Local flow between Schoharie and Ashokan Reservoirs.
4	0.	Receives diversion from CP No. 3; no local flow.
5	0.	No local flow.

Flow Requirements and Constraints

The following table shows the flow requirements and constraints by control point:

	Control Point				
	1	2	3	4	5
Diversion Requirement (QDV; ID card, field 1)	63	*	52	*	0
Minimum desired flow (QMN; ID card, field 2)	0	0	0	0	**
Minimum required flow (QM2; ID card, field 3)	0	0	0	0	0
Maximum Permissible Flow (QMXX; ID card, field 4)	928	99999***	958	99999	958

*The diversion is actually a return flow and is indicated on the DV card. In both these cases, the return flow is 100 percent of the diversion.

**The minimum desired flow at CP No. 5 varied by month; therefore, a QD card was used for input.

***There is no actual maximum flow constraint, so a large number was used.

Reservoir Data

The reservoir storage has been specified by four levels (NL; J1 card, field 3). The first level is the minimum pool, the second is the top of the buffer zone, the third the top of the conservation storage, and fourth the top of the flood control pool. (See Exhibit 1 for a further description of levels.) There is no buffer storage or flood control storage in this test, but a minimum of four levels must be specified.

	Reservoir Storage	
	Schoharie	Ashokan
Initial Capacity (STOR1; R1 card, field 2)	64,166	339,016
Top Flood Control Pool (RL card, Level 4)	66,000	393,000
Top Conservation Pool (RL card, Level 3)	66,000	393,000
Top Buffer Storage (RL card, Level 2)	6,140	6,140
Minimum Pool (RL card, Level 1)	6,140	6,140

TEST DATA - INPUT

```
T1                                         TEST DATA 1
T2                                  RESERVOIR SYSTEM ANALYSIS
T3                                         JUNE 1974
J1      5     1928        4        0        0        0        1        0        0
J4      3
J5     12       10
J8     1.       1.       1.        0        0       1.       2.       2.       3.       3.
J8     2.       2.
CP      1        3        0
ID     63        0        0      928   SCHOHARIE RES.
LF      1        6     1.33
R1     1.    64166        0        0
RL      1        1       -1       10      614
RL      3        1       -1     1000       66
RS      0      123     1070     3530     6140     9660    21200    36800    55200 66000.1
RA      0       20       80      190      300      440      690      850     1000     1145
RQ    928      928      928      928      928      928      928      928      928      928
RE    980     1000     1020     1040     1050     1060     1080     1100     1120     1130
CP      2        3        0
ID      0        0        0    99999   DOWNSTREAM
LF      1        6        0
DV      1       -1
CP      3        5        0
ID     52        0        0      958   ASHOKAN RES.
LF      1        6     1.09
R1      1   339016        0        0
RL      1        3       -1        1     6140
RL      3        3       -1     1000      393
RS      0     1230     6140    15300    55200   138000   254000393000.1
RA      0      150      333     1343     3312     4983     6671     8425
RQ    960      960      960      960      960      960      960      960
RE    404      470      496      510      530      550      570      590
CP      4        5        0
ID      0        0        0    99999   DOWNSTREAM
LF      1        6        0
DV      3       -1
CP      5       -1        0
ID      0        0        0      958   KENSICO INFLOW
LF      1        6        0
QD    592      575      575      551      551      530      534      530      580      643
QD    625      615
ED
IN    928   1060   1527   1546    272    545    578   1031   1030    924    708    343    224
IN    929     63     58    111    343    148   1281   1797    887    251     84     18     47
IN    930    626    557    526    519    371    906    575    295    502     63     29     29
IN    931     20     71     75     49     39    365   1805    917    642    454     91     55
IN    932     25     37    184    697    471    389   1391    404    264     95     28     14
ER
```

```
*******************************
* RESERVOIR SYSTEM ANALYSIS  *
* 723-X6-L2030   1 JULY 1974 *
*******************************

                                        TEST DATA 1
                                 RESERVOIR SYSTEM ANALYSIS
                                         JUNE 1974

 NYRS   IYR    NL ICONS IDVSP IPWPR IDVPR IFLOW JUPQI
   5  1925      4     0     0     0     1     0     0

CLOCL CFLOD IUNIT METRC   CNSTI     CNSTO      CCFS CUNIT   CACFT VUNIT IPRNT  IPRL IPWKW IUPDT IDGST
 1.00  1.00     0     0   1.000     1.000     1.000   CFS   1.000  ACFT     0     0     0     0     0

IRG(1)= 3  IRG(2)=-0  IRG(3)=-0  IRG(4)=-0  IRG(5)=-0  IRG(6)=-0  IRG(7)=-0  IRG(8)=-0  IRG(9)=-0  IRG(10)=-0

NPER= 12  IPERA=  10

PERIOD          OCT      NOV      DEC      JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP
NDAYS            31       30       31       31       28       31       30       31       30       31       31       30
EVP            1.00     1.00     1.00      0.       0.     1.00     2.00     2.00     3.00     3.00     2.00     2.00

CONTROL POINT SEQUENCE

***********************************************
* CP NO   1   SCHOHARIE RES.                  *
***********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW      QDV      QMN      QM2    QMXX
   3     1     1     0     0     0     1      63.       0.       0.    928.
MQ AND RTIO=       6   1.330

RESERVOIR DATAX

 INITIAL STOR =   64166.  CEVAP = 1.000  QLKG =      0.  ISRCH =   0

                                                  * * * S T O R A G E S * * *
                    OCT      NOV      DEC      JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP
LEVEL   4        66000.   66000.   66000.   66000.   66000.   66000.   66000.   66000.   66000.   66000.   66000.   66000.
LEVEL   3        66000.   66000.   66000.   66000.   66000.   66000.   66000.   66000.   66000.   66000.   66000.   66000.
LEVEL   2         6140.    6140.    6140.    6140.    6140.    6140.    6140.    6140.    6140.    6140.    6140.    6140.
LEVEL   1         6140.    6140.    6140.    6140.    6140.    6140.    6140.    6140.    6140.    6140.    6140.    6140.

STOR                 0.     123.    1670.    3530.    6140.    9660.   21200.   36800.   55200.   66000.
AREA                 0.     20.0     80.0    190.0    300.0    440.0    690.0    850.0   1000.0   1145.0
QCAP               928.     928.     928.     928.     928.     928.     928.     928.     928.     928.
ELEV             980.00  1000.00  1020.00  1040.00  1050.00  1060.00  1080.00  1100.00  1120.00  1130.00

***********************************************
* CP NO   2   DOWNSTREAM                      *
***********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW      QDV      QMN      QM2    QMXX
   3     1     0     0     0     0     1      -1.       0.       0.  99999.
MQ AND RTIO=       6   0.
DIVERSION=-1.000 TIMES DIVERSION AT  1
```

```
**********************************************
* CP NO   3   ASHOKAN RES.                    *
**********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW     QDV      QMN      QM2     QMXX
   5     1     1     0     0     0     1      52.       0.       0.     958.
MQ AND RTIO=        6   1.090

RESERVOIR DATAX

 INITIAL STOR =  339016.  CEVAP = 1.000  QLKG =       0.  ISRCH =   0

                                                    * * * S T O R A G E S * * *
                 OCT       NOV       DEC       JAN       FEB       MAR       APR       MAY       JUN       JUL       AUG       SEP
LEVEL    4   393000.   393000.   393000.   393000.   393000.   393000.   393000.   393000.   393000.   393000.   393000.   393000.
LEVEL    3   393000.   393000.   393000.   393000.   393000.   393000.   393000.   393000.   393000.   393000.   393000.   393000.
LEVEL    2     6140.     6140.     6140.     6140.     6140.     6140.     6140.     6140.     6140.     6140.     6140.     6140.
LEVEL    1     6140.     6140.     6140.     6140.     6140.     6140.     6140.     6140.     6140.     6140.     6140.     6140.

STOR              0.     1230.     6140.    15300.    55200.   138000.   254000.   393000.
AREA              0.     150.0     338.0    1343.0    3312.0    4983.0    6671.0    8425.0
QCAP            960.      960.      960.      960.      960.      960.      960.      960.
ELEV          404.00    470.00    496.00    510.00    530.00    550.00    570.00    590.00

**********************************************
* CP NO   4   DOWNSTREAM                      *
**********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW     QDV      QMN      QM2     QMXX
   5     1     0     0     0     0     1      -1.       0.       0.   99999.
MQ AND RTIO=        6   0.
DIVERSION=-1.000 TIMES DIVERSION AT  3

**********************************************
* CP NO   5   KENSICO INFLOW                  *
**********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW     QDV      QMN      QM2     QMXX
  -1     0     0     0     0     0     1       0.      -1.       0.     958.
MQ AND RTIO=        6   0.
QMIN            592.      575.      575.      551.      551.      530.      534.      530.      580.      643.      625.      615.
```

ANNUAL INPUT DATA FOR 1928
**INFLOWS

STA 6	1060.	1527.	1546.	272.	545.	578.	1031.	1030.	924.	708.	343.	224.

ALL FLOWS IN CFS, STORAGES AND EVAP IN ACFT, AND POWER IN THOUSAND KWH

++

1 SCHOHARIE RES. LEAKAGE 0. SERVED BY 1
SERVING 1 3 5
LOCAL DIVERSIONS 1

YR 1928	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	1086.	1410.	2031.	2056.	362.	725.	769.	1371.	1370.	1229.	942.	456.	298.
UNREG	1086.	1410.	2031.	2056.	362.	725.	769.	1371.	1370.	1229.	942.	456.	298.
INFLOW	1086.	1410.	2031.	2056.	362.	725.	769.	1371.	1370.	1229.	942.	456.	298.
REQ DIV	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
DIVERSN	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
EOP STR		66000	66000	66000	66000	66000	66000	66000	66000	66000	66000	66000	60073
EOP EL		1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1124.51
EVAPO	1710.	94.	95.	95.	0.	0.	95.	191.	191.	286.	286.	191.	184.
CASE		103	103	103	103	103	103	103	103	103	103	103	501
LEVEL		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.90
CSV REL	59.	0.	0.	0.	192.	0.	0.	0.	0.	0.	0.	188.	331.
RIV FLW	1026.	1315.	1966.	1992.	299.	662.	704.	1305.	1304.	1161.	874.	390.	331.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

2 DOWNSTREAM LEAKAGE
LOCAL DIVERSIONS 2

YR 1928	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
INFLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
REQ DIV	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
DIVERSN	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

3 ASHOKAN RES. LEAKAGE 0. SERVED BY 1 3
SERVING 3 5
LOCAL DIVERSIONS 2 3

YR 1928	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	890.	1155.	1664.	1685.	296.	594.	630.	1124.	1123.	1007.	772.	374.	244.
UNREG	1976.	2565.	3695.	3741.	658.	1319.	1399.	2495.	2493.	2236.	1713.	630.	542.
INFLOW	1980.	2534.	3694.	3740.	658.	1319.	1397.	2492.	2489.	2231.	1709.	627.	639.
REQ DIV	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
DIVERSN	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

ANNUAL INPUT DATA FOR 1928
**INFLOWS

STA 6											
1060.	1527.	1546.	272.	545.	578.	1031.	1030.	924.	708.	343.	224.

ALL FLOWS IN CFS, STORAGES AND EVAP IN ACFT, AND POWER IN THOUSAND KWH

++

1 SCHOHARIE RES. LEAKAGE 0. SERVED BY 1
SERVING 1 3 5
LOCAL DIVERSIONS 1

YR 1928	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	1086.	1410.	2031.	2056.	362.	725.	769.	1371.	1370.	1229.	942.	456.	298.
UNREG	1086.	1410.	2031.	2056.	362.	725.	769.	1371.	1370.	1229.	942.	456.	298.
INFLOW	1086.	1410.	2031.	2056.	362.	725.	769.	1371.	1370.	1229.	942.	456.	292.
REQ DIV	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
DIVERSN	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
EOP STR		66000	66000	66000	66000	66000	66000	66000	66000	66000	66000	66000	60073
EOP EL		1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1124.51
EVAPO	1710.	94.	95.	95.	0.	0.	95.	191.	191.	286.	286.	191.	184.
CASE		103	103	103	103	103	103	103	103	103	103	103	501
LEVEL		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.90
CSV REL	59.	0.	0.	0.	192.	0.	0.	0.	0.	0.	0.	188.	331.
RIV FLW	1026.	1315.	1966.	1992.	299.	662.	704.	1305.	1304.	1161.	874.	390.	331.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

2 DOWNSTREAM LEAKAGE
LOCAL DIVERSIONS 2

YR 1928	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
INFLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
REQ DIV	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
DIVERSN	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

3 ASHOKAN RES. LEAKAGE 0. SERVED BY 1 3
SERVING 3 5
LOCAL DIVERSIONS 2 3

YR 1928	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	990.	1155.	1664.	1685.	296.	594.	630.	1124.	1123.	1007.	772.	374.	244.
UNREG	1976.	2565.	3695.	3741.	658.	1319.	1399.	2495.	2493.	2236.	1713.	630.	502.
INFLOW	1980.	2534.	3694.	3740.	658.	1319.	1397.	2492.	2489.	2231.	1709.	627.	639.
REQ DIV	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
DIVERSN	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

ANNUAL INPUT DATA FOR 1929
**INFLOWS

STA 6	63.	58.	111.	343.	148.	1281.	1797.	887.	251.	84.	18.	47.

ALL FLOWS IN CFS, STORAGES AND EVAP IN ACFT, AND POWER IN THOUSAND KWH

1 SCHOHARIE RES. LEAKAGE 0. SERVED BY 1
SERVING 1 3 5
LOCAL DIVERSIONS 1

YR 1929	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	565.	84.	77.	148.	456.	197.	1704.	2390.	1180.	334.	112.	24.	63.
UNREG	565.	84.	77.	148.	456.	197.	1704.	2390.	1180.	334.	112.	24.	63.
INFLOW	565.	84.	77.	148.	456.	197.	1704.	2390.	1180.	334.	112.	24.	63.
REQ DIV	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
DIVERSN	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
EOP STR		32267	19211	14019	20757	16195	66000	66000	66000	65240	35856	17161	10423
EOP EL		1094.19	1076.55	1067.55	1079.23	1071.33	1130.00	1130.00	1130.00	1129.30	1098.79	1073.00	1061.32
EVAPR	1381.	77.	61.	49.	0.	0.	74.	191.	191.	285.	240.	124.	86.
CASE		501	501	501	501	501	103	103	103	501	501	501	501
LEVEL		2.44	2.22	2.13	2.24	2.17	3.00	3.00	3.00	2.99	2.50	2.18	2.07
CSV REL	213.	472.	233.	168.	284.	216.	0.	0.	0.	279.	523.	263.	111.
RIV FLW	549.	472.	233.	169.	284.	216.	830.	2324.	1114.	279.	523.	263.	111.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

2 DOWNSTREAM LEAKAGE
LOCAL DIVERSIONS 2

YR 1929	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
INFLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
REQ DIV	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
DIVERSN	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

3 ASHOKAN RES. LEAKAGE 0. SERVED BY 1 3
SERVING 3 5
LOCAL DIVERSIONS 2 3

YR 1929	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	463.	69.	63.	121.	374.	161.	1396.	1959.	967.	274.	92.	20.	51.
UNREG	1029.	152.	140.	269.	830.	358.	3100.	4349.	2147.	607.	203.	44.	114.
INFLOW	1095.	603.	359.	352.	720.	440.	2289.	4345.	2143.	615.	677.	346.	225.
REQ DIV	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
DIVERSN	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

EOP STR		393000	379437	365061	375482	369334	393000	393000	393000	393000	393000	374436	349919
EOP EL		590.00	588.05	585.98	587.48	586.59	590.00	590.00	590.00	590.00	590.00	587.33	583.80
EVAPO	12512.	702.	695.	680.	0.	0.	690.	1404.	1404.	2106.	2106.	1385.	1339.
CASE		501	501	501	501	501	303	303	303	501	501	501	501
LEVEL		3.00	2.96	2.93	2.95	2.94	3.00	3.00	3.00	3.00	3.00	2.95	2.89
CSV REL	523.	540.	523.	523.	499.	499.	478.	482.	478.	528.	591.	573.	563.
RIV FLW	1085.	540.	523.	523.	499.	499.	1841.	4270.	2069.	528.	591.	573.	563.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

4 DOWNSTREAM LEAKAGE
LOCAL DIVERSIONS 4

YR 1929	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
INFLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
REQ DIV	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0
DIVERSN	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

5 KENSICO INFLOW LEAKAGE 0. SERVED BY 1 3
LOCAL DIVERSIONS 4

YR 1929	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	1029.	192.	140.	269.	830.	358.	3100.	4349.	2147.	607.	203.	44.	114.
RIV FLW	1137.	592.	575.	575.	551.	551.	1893.	4322.	2121.	580.	643.	625.	615.
DES FLW	575.	592.	575.	575.	551.	551.	530.	534.	530.	580.	643.	625.	615.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

ANNUAL INPUT DATA FOR 1930
**INFLOWS

STA 6	626.	557.	526.	519.	371.	906.	575.	295.	502.	63.	29.	29.

ALL FLOWS IN CFS, STORAGES AND EVAP IN ACFT, AND POWER IN THOUSAND KWH

++

1 SCHOHARIE RES. LEAKAGE 0. SERVED BY 1
SERVING 1 3 5
LOCAL DIVERSIONS 1

YR 1930	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	554.	833.	741.	700.	690.	493.	1205.	765.	392.	668.	84.	39.	39.
UNREG	554.	833.	741.	700.	690.	493.	1205.	765.	392.	668.	84.	39.	39.
INFLOW	554.	833.	741.	700.	690.	493.	1205.	765.	392.	668.	84.	39.	39.
REQ DIV	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
DIVERSN	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
FOP STR		28241	66000	66000	66000	66000	66000	66000	66000	66000	33493	16702	9684
FOP EL		1089.03	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1130.00	1095.76	1072.20	1060.04
EVAPO	1437.	54.	78.	95.	0.	0.	95.	191.	191.	286.	239.	122.	86.
CASE		501	103	103	103	103	103	103	103	103	501	501	501
LEVEL		2.37	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.46	2.18	2.06
CSV REL	134.	479.	0.	0.	0.	84.	0.	0.	145.	0.	546.	247.	92.
RIV FLW	490.	479.	42.	635.	627.	430.	1140.	699.	326.	600.	546.	247.	92.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

2 DOWNSTREAM LEAKAGE
LOCAL DIVERSIONS 2

YR 1930	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
INFLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
REQ DIV	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
DIVERSN	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

3 ASHOKAN RES. LEAKAGE 0. SERVED BY 1 3
SERVING 3 5
LOCAL DIVERSIONS 2 3

YR 1930	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	454.	682.	607.	573.	566.	404.	988.	627.	322.	547.	69.	32.	32.
UNREG	1009.	1515.	1348.	1273.	1256.	898.	2193.	1392.	714.	1215.	152.	70.	70.
INFLOW	1008.	1224.	712.	1271.	1256.	898.	2191.	1388.	711.	1210.	677.	341.	187.
REQ DIV	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
DIVERSN	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
EOP STR		388118	393000	393000	393000	393000	393000	393000	393000	393000	393000	374171	347347
EOP EL		589.30	590.00	590.00	590.00	590.00	590.00	590.00	590.00	590.00	590.00	587.29	583.43
EVAPO	12522.	677.	700.	702.	0.	0.	702.	1404.	1404.	2106.	2106.	1384.	1336.
CASE		501	303	303	303	303	303	303	303	303	501	501	501
LEVEL		2.99	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.95	2.88
CSV REL	523.	540.	523.	523.	499.	499.	478.	482.	478.	528.	591.	573.	563.
RIV FLW	942.	540.	566.	1208.	1204.	846.	2128.	1313.	636.	1123.	591.	573.	563.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

4 DOWNSTREAM LEAKAGE
LOCAL DIVERSIONS 4

YR 1930	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
INFLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
REQ DIV	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0
DIVERSN	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

5 KENSICO INFLOW LEAKAGE 0. SERVED BY 1 3
LOCAL DIVERSIONS 4

YR 1930	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	1009.	1515.	1348.	1273.	1256.	898.	2193.	1392.	714.	1215.	152.	70.	70.
RIV FLW	994.	592.	618.	1260.	1256.	898.	2180.	1365.	688.	1175.	643.	625.	615.
DES FLW	575.	592.	575.	575.	551.	551.	530.	534.	530.	580.	643.	625.	615.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

ANNUAL INPUT DATA FOR 1931
**INFLOWS

STA 6	20.	71.	75.	49.	39.	365.	1805.	917.	642.	454.	91.	55.

ALL FLOWS IN CFS, STORAGES AND EVAP IN ACFT, AND POWER IN THOUSAND KWH

+++

1 SCHOHARIE RES. LEAKAGE 0. SERVED BY 1
SERVING 1 3 5
LOCAL DIVERSIONS 1

YR 1931	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	508.	27.	94.	100.	65.	52.	485.	2401.	1220.	854.	604.	121.	73.
UNREG	508.	27.	94.	100.	65.	52.	485.	2401.	1220.	854.	604.	121.	73.
INFLOW	508.	27.	94.	100.	65.	52.	485.	2401.	1220.	854.	604.	121.	73.
REQ DIV	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
DIVERSN	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
EOP STR		6569	7165	7548	6843	6179	18522	66000	66000	66000	66000	39544	20838
EOP EL		1051.50	1052.91	1054.00	1052.09	1050.11	1075.36	1130.00	1130.00	1130.00	1130.00	1102.98	1079.37
EVAPC	1336.	32.	22.	29.	0.	0.	42.	149.	191.	286.	286.	163.	130.
CASE		501	501	501	501	501	501	103	103	103	103	501	501
LEVEL		2.01	2.02	2.02	2.01	2.00	2.21	3.00	3.00	3.00	3.00	2.56	2.25
CSV REL	100.	12.	23.	30.	14.	1.	221.	0.	0.	0.	85.	486.	322.
RIV FLW	428.	12.	23.	30.	14.	1.	221.	1537.	1154.	786.	536.	486.	322.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

+++

2 DOWNSTREAM LEAKAGE
LOCAL DIVERSIONS 2

YR 1931	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
INFLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
REQ DIV	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
DIVERSN	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

+++

3 ASHOKAN RES. LEAKAGE 0. SERVED BY 1 3
SERVING 3 5
LOCAL DIVERSIONS 2 3

YR 1931	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	416.	22.	77.	82.	53.	43.	398.	1967.	1000.	700.	495.	99.	60.
UNREG	924.	48.	172.	182.	119.	94.	883.	4368.	2219.	1554.	1099.	220.	133.
INFLOW	907.	97.	163.	175.	130.	106.	682.	3568.	2216.	1549.	1094.	648.	445.
REQ DIV	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
DIVERSN	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

EOP STR		316268	291145	265957	240074	215379	224203	393000	393000	393000	393000	393000	381509
EOP EL		578.96	575.34	571.72	567.60	563.34	564.86	590.00	590.00	590.00	590.00	590.00	588.35
EVAPO	11982.	638.	608.	582.	0.	0.	514.	1227.	1404.	2106.	2106.	1404.	1392.
CASE		501	501	501	501	501	501	303	303	303	303	501	501
LEVEL		2.80	2.74	2.67	2.60	2.54	2.5[illegible]	3.00	3.00	3.00	3.00	3.00	2.97
CSV REL	523.	540.	523.	523.	499.	499.	478.	482.	478.	528.	591.	573.	563.
RIV FLW	791.	540.	523.	523.	499.	499.	478.	658.	2141.	1461.	1008.	573.	563.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

4 DOWNSTREAM LEAKAGE
LOCAL DIVERSIONS 4

YR 1931	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
INFLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
REQ DIV	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0
DIVERSN	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

5 KENSICO INFLOW LEAKAGE 0. SERVED BY 1 3
LOCAL DIVERSIONS 4

YR 1931	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	924.	48.	172.	182.	119.	94.	883.	4368.	2219.	1554.	1099.	220.	133.
RIV FLW	843.	592.	575.	575.	551.	551.	530.	710.	2193.	1513.	1060.	625.	615.
DES FLW	575.	592.	575.	575.	551.	551.	530.	534.	530.	580.	643.	625.	615.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

ANNUAL INPUT DATA FOR 1932
**INFLOWS

STA 6	25.	37.	184.	697.	471.	389.	1391.	404.	264.	95.	26.	14.

ALL FLOWS IN CFS, STORAGES AND EVAP IN ACFT, AND POWER IN THOUSAND KWH

++

1 SCHOHARIE RES. LEAKAGE 0. SERVED BY 1
SERVING 1 3 5
LOCAL DIVERSIONS 1

YR 1932	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	440.	33.	49.	245.	927.	626.	517.	1850.	537.	351.	126.	37.	19.
UNREG	440.	33.	49.	245.	927.	626.	517.	1850.	537.	351.	126.	37.	19.
INFLOW	440.	33.	49.	245.	927.	626.	517.	1850.	537.	351.	126.	37.	19.
REQ DIV	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
DIVERSN	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
EOP STR		11467	8072	11790	33874	40256	64767	65000	66000	660	36250	18603	9963
EOP EL		1063.13	1055.49	1063.69	1096.25	1103.76	1128.86	1130.00	1130.00	1130.00	1101.58	1075.50	1060.53
EVAPO	1332.	48.	37.	37.	0.	0.	82.	189.	191.	286.	244.	127.	90.
CASE		501	501	501	501	501	501	103	103	103	501	501	501
LEVEL		2.09	2.03	2.09	2.46	2.57	2.98	3.00	3.00	3.00	2.54	2.21	2.04
RSV REL	203.	122.	43.	121.	505.	449.	54.	0.	27.	229.	511.	292.	99.
RIV FLW	391.	122.	43.	121.	505.	449.	54.	1763.	471.	283.	511.	292.	99.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

2 DOWNSTREAM LEAKAGE
LOCAL DIVERSIONS 2

YR 1932	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
INFLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
REQ DIV	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
DIVERSN	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0	-63.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.	63.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

3 ASHOKAN RES. LEAKAGE 0. SERVED BY 1 3
SERVING 3 5
LOCAL DIVERSIONS 2 3

YR 1932	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	341.	27.	40.	201.	760.	513.	424.	1516.	440.	288.	104.	31.	15.
UNREG	801.	61.	90.	445.	1687.	1140.	941.	3366.	978.	639.	230.	68.	34.
INFLOW	814.	212.	146.	384.	1328.	1025.	541.	3342.	975.	634.	677.	365.	178.
REQ DIV	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
DIVERSN	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

EOP STR		357473	331293	318932	366631	393000	393000	393000	393000	393000	393000	376869	349499
EOP EL		584.09	581.12	579.34	586.21	590.00	590.00	590.00	590.00	590.00	590.00	587.68	583.74
EVAPC	12411.	677.	651.	631.	0.	0.	702.	1403.	1404.	2106.	2106.	1387.	1391.
CASE		501	501	501	501	501	501	303	303	303	501	501	501
LEVEL		2.91	2.88	2.81	2.93	3.00	3.00	3.00	3.00	3.00	3.00	2.96	2.89
CSV REL	523.	540.	523.	523.	499.	499.	478.	482.	478.	528.	591.	573.	563.
RIV FLW	790.	540.	523.	523.	499.	499.	478.	3267.	900.	547.	591.	573.	563.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

4 DOWNSTREAM LEAKAGE
LOCAL DIVERSIONS 4

YR 1932	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
INFLOW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
REQ DIV	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0
DIVERSN	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-52.0	-32.0	-52.0	-52.0	-52.0	-52.0	-52.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.	52.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

5 KENSICO INFLOW LEAKAGE 0. SERVED BY 1 3
LOCAL DIVERSIONS 4

YR 1932	AVG	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	801.	61.	90.	445.	1687.	1140.	941.	3366.	978.	639.	230.	68.	34.
RIV FLW	842.	592.	575.	575.	551.	551.	530.	3319.	952.	599.	643.	625.	615.
DES FLW	575.	592.	575.	575.	551.	551.	530.	534.	530.	580.	643.	625.	615.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

AVERAGES FOR PERIOD OF OPERATION 1928 - 1932

1 SCHOHARIE RES.

LOC FLW	631.
UNREG	631.
INFLOW	631.
REQ DIV	63.0
DIVERSN	63.0
SHORTGE	0.
EVAPC	1439.
CSV REL	182.
RIV FLW	581.
DES FLW	0.
SHORTGE	0.

2 DOWNSTREAM

LOC FLW	0.
UNREG	0.
INFLOW	0.
REQ DIV	-63.0
DIVERSN	-63.0
SHORTGE	0.
RIV FLW	63.
DES FLW	0.
SHORTGE	0.

3 ASHOKAN RES.

LOC FLW	517.
UNREG	1148.
INFLOW	1161.
REQ DIV	52.0
DIVERSN	52.0
SHORTGE	0.
EVAPO	12407.
CSV REL	523.
RIV FLW	1089.
DES FLW	0.
SHORTGE	0.

4 DOWNSTREAM

LOC FLW	0.
UNREG	0.
INFLOW	0.
REQ DIV	-52.0
DIVERSN	-52.0
SHORTGE	0.
RIV FLW	52.
DES FLW	0.
SHORTGE	0.

5 KENSICO INFLOW

LOC FLW	0.
UNREG	1148.
RIV FLW	1161.
DES FLW	575.
SHORTGE	0.

DIVERSION SHORTAGE INDEX	1 0.	2 -1.000	3 0.	4 -1.000	
DES FLOW SHORTAGE INDEX	1 -1.000	2 -1.000	3 -1.000	4 -1.000	5 .000
MIN FLOW SHORTAGE INDEX	1 -1.000	2 -1.000	3 -1.000	4 -1.000	5 -1.000

	DIVRSION SHORTAGES		DES FLOW SHORTAGES		MIN FLOW SHORTAGES		SYS PWR SHORTAGES		AT SITE PWR SHRTGS	
STA	NO	MAX	NO	MAX	NO	MAX	NO	MAX	NO	MAX
1	0	0.	0	0.	0	0.	0	0.	0	0.
2	-	-	0	0.	0	0.	0	0.	0	0.
3	0	0.	0	0.	0	0.	0	0.	0	0.
4	-	-	0	0.	0	0.	0	0.	0	0.
5	-	-	0	0.	0	0.	0	0.	0	0.

STORAGE FREQUENCY PER 5 YEARS AT LOCATION 1

CONS POOL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
99-100 PCT	1	2	2	2	2	3	5	5	4	2	1	0
95- 99 PCT	0	0	0	0	0	1	0	0	1	0	0	0
90- 95 PCT	0	0	0	0	0	0	0	0	0	0	0	1
80- 90 PCT	0	0	0	0	0	0	0	0	0	0	0	0
70- 80 PCT	0	0	0	0	0	0	0	0	0	0	0	0
60- 70 PCT	0	0	0	0	0	0	0	0	0	0	0	0
40- 60 PCT	1	0	0	1	1	0	0	0	0	3	1	0
20- 40 PCT	1	1	0	1	0	1	0	0	0	0	1	1
1- 20 PCT	1	2	3	1	1	0	0	0	0	0	2	3
0- 1 PCT	1	0	0	0	1	0	0	0	0	0	0	0

STORAGE FREQUENCY PER 5 YEARS AT LOCATION 3

CONS POOL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
99-100 PCT	2	2	2	2	3	4	5	5	5	5	2	1
95- 99 PCT	1	1	0	1	0	0	0	0	0	0	3	1
90- 95 PCT	1	0	1	1	1	0	0	0	0	0	0	0
80- 90 PCT	1	1	1	0	0	0	0	0	0	0	0	3
70- 80 PCT	0	1	0	0	0	0	0	0	0	0	0	0
60- 70 PCT	0	0	1	1	0	0	0	0	0	0	0	0
40- 60 PCT	0	0	0	0	1	1	0	0	0	0	0	0
20- 40 PCT	0	0	0	0	0	0	0	0	0	0	0	0
1- 20 PCT	0	0	0	0	0	0	0	0	0	0	0	0
0- 1 PCT	0	0	0	0	0	0	0	0	0	0	0	0

TEST DATA 1
RESERVOIR SYSTEM ANALYSIS
JUNE 1974

UNREGULATED FLOWS IN CFS

CP NO. 1 SCHOHARIE RES.

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVG
1928	1410.	2031.	2056.	362.	725.	769.	1371.	1370.	1229.	942.	456.	298.	1086.
1929	84.	77.	148.	456.	197.	1704.	2390.	1180.	334.	112.	24.	63.	545.
1930	833.	741.	700.	690.	493.	1205.	765.	392.	668.	84.	39.	39.	554.
1931	27.	94.	100.	65.	52.	485.	2401.	1220.	854.	604.	121.	73.	508.
1932	33.	49.	245.	927.	626.	517.	1850.	537.	351.	126.	37.	19.	440.
AVERAGE	477.	599.	650.	500.	419.	936.	1755.	940.	687.	373.	135.	98.	631.

CP NO. 2 DOWNSTREAM

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVG
1928	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1929	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1930	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1931	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1932	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AVERAGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

CP NO. 3 ASHOKAN RES.

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVG
1928	2565.	3695.	3741.	658.	1319.	1399.	2495.	2493.	2236.	1713.	830.	542.	1976.
1929	152.	140.	269.	830.	358.	3100.	4349.	2147.	607.	203.	44.	114.	1029.
1930	1515.	1348.	1273.	1256.	898.	2193.	1392.	714.	1215.	152.	70.	70.	1009.
1931	48.	172.	182.	119.	94.	883.	4368.	2219.	1554.	1099.	220.	133.	924.
1932	61.	90.	445.	1687.	1140.	941.	3366.	978.	639.	230.	68.	34.	801.
AVERAGE	868.	1089.	1182.	910.	762.	1703.	3194.	1710.	1250.	680.	246.	179.	1148.

CP NO. 4 DOWNSTREAM

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVG
1928	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1929	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1930	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1931	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1932	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AVERAGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

+ CP NO 5 KENSICO INFLOW +

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVG
1928	2565.	3695.	3741.	658.	1319.	1399.	2495.	2493.	2236.	1713.	830.	542.	1976.
1929	152.	140.	269.	830.	358.	3100.	4349.	2147.	607.	203.	44.	114.	1029.
1930	1515.	1348.	1273.	1256.	898.	2193.	1392.	714.	1215.	152.	70.	70.	1009.
1931	48.	172.	182.	119.	94.	883.	4368.	2219.	1554.	1099.	220.	133.	924.
1932	61.	90.	445.	1687.	1140.	941.	3366.	978.	639.	230.	68.	34.	801.
AVERAGE	868.	1089.	1182.	910.	762.	1703.	3194.	1710.	1250.	680.	246.	179.	1148.

TEST DATA 1
RESERVOIR SYSTEM ANALYSIS
JUNE 1974

UNREGULATED FLOWS IN CFS

YEAR 1928

CP NO	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVG
1	1410.	2031.	2056.	362.	725.	769.	1371.	1370.	1229.	942.	456.	298.	1086.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	2565.	3695.	3741.	658.	1319.	1399.	2495.	2493.	2236.	1713.	830.	542.	1976.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	2565.	3695.	3741.	658.	1319.	1399.	2495.	2493.	2236.	1713.	830.	542.	1976.

YEAR 1929

CP NO	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVG
1	84.	77.	148.	456.	197.	1704.	2390.	1180.	334.	112.	24.	63.	565.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	152.	140.	269.	830.	358.	3100.	4349.	2147.	607.	203.	44.	114.	1029.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	152.	140.	269.	930.	358.	3100.	4349.	2147.	607.	203.	44.	114.	1029.

YEAR 1930

CP NO	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVG
1	833.	741.	700.	690.	493.	1205.	765.	392.	668.	84.	39.	39.	554.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	1515.	1348.	1273.	1256.	898.	2193.	1392.	714.	1215.	152.	70.	70.	1009.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	1515.	1348.	1273.	1256.	898.	2193.	1392.	714.	1215.	152.	70.	70.	1009.

YEAR 1931

CP NO	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVG
1	27.	94.	100.	65.	52.	485.	2401.	1220.	854.	604.	121.	73.	508.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	48.	172.	182.	119.	94.	883.	4368.	2219.	1554.	1099.	220.	133.	924.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	48.	172.	182.	119.	94.	883.	4368.	2219.	1554.	1099.	220.	133.	924.

YEAR 1932

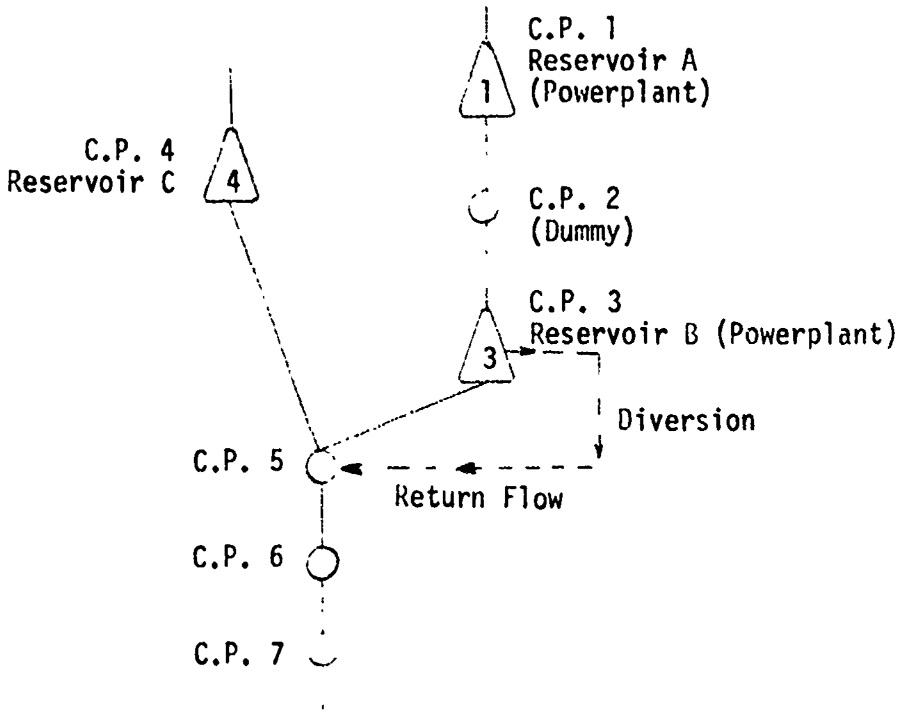
CP NO	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVG
1	33.	49.	245.	927.	626.	517.	1850.	537.	351.	126.	37.	19.	440.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	61.	90.	445.	1687.	1140.	941.	3366.	978.	639.	230.	68.	34.	801.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	61.	90.	445.	1687.	1140.	941.	3366.	978.	639.	230.	68.	34.	801.

EXHIBIT 2

TEST DATA 2 - DESCRIPTION

General

This test problem illustrates the input for a reservoir system that includes hydroelectric power as one of the project purposes. The system is comprised of three reservoirs and two powerplants - one each at Reservoir A and at Reservoir B (see schematic). There are four other control points. One of the control points (CP No. 2) is a dummy to show that it may be necessary to add such points occasionally to perform some other operation, such as to make a second diversion. Two years of monthly flows are used for the test of the system simulation.



Hydrologic Data

Average monthly evaporation data over the system area for the 2-year period was obtained and input by the J8 card.

The following ratios were used to derive evaporation at each reservoir site.

	Ratio
Reservoir A	.9
Reservoir B	1.0
Reservoir C	1.0

Streamflow data were available at four stations (1, 3, 4, 5) during the period to be simulated. The streamflow at the other sites were computed as ratios of these stations.

CP No. 2	0. times flow at Station No. 1 (no local flow).
CP No. 3	Station No. 3 minus Station No. 1 (to obtain local flow).
CP No. 5	Station No. 5 minus Station No. 3 minus Station No. 4
CP No. 6	Increase in local flow equal to flow at Station No. 1
CP No. 7	Increase in local flow equal to flow at Station No. 4

Flow Requirements and Constraints

The following table shows the demands and flow constraints by control point.

	Control Point						
	1	2	3	4	5	6	7
Diversion Requirement (QDV; ID card, field 1)	0	0	1000	0	**	0	0
Minimum desired flow (QMN; ID card, field 2)	0	0	0	100	-1*	0	0
Minimum required flow (QM2; ID card, field 3)	0	0	0	0	100	0	0
Maximum Permissible Flow (QMXX; ID card, field 4)	99999***	99999	99999	99999	5000	99999	99999

* The minimum desired flow varies by month and is input by the QD card.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
100	100	100	2000	4500	4500	4500	4500	4500	100	100	100

**The diversion is actually a return flow and is indicated on the DV card. In this case the return is 25 percent of the diversion made at CP No. 3.

***If there is no actual maximum flow constraint, a large number may input.

Reservoir Data

The reservoir storage has been subdivided into seven levels (NL; J1 card, field 3). The first level is that storage capacity below which no releases will be made. For this test data only two levels, 1 and 7, remained constant throughout the year. The operation plan called for the target levels to vary seasonally to account for changing runoff potential. (See Exhibit 1 for a description of level specification.)

	Reservoir		
	A	B	C
Initial Capacity (STØR1; R1 card, field 2)	156,000	106,600	10,000
Minimum Pool (R1 card, Level 1)	107,000	106,600	10,000
Top Flood Control Pool (RL card, Level 7)	356,000	456,000	125,000

The remaining levels varied by month and the values should be evident in the listing of input cards and in the output listing.

Power Requirements

The two hydroelectric plants have individual site energy requirements as well as a system energy requirement of 25,000,000 kilowatt-hours (J9 card). The maximum plant factor for power generating for each project to contribute to system power load is 0.5 (PFMAX; P1 card, field 8). The at-site energy requirement at each project is specified by a plant factor of 0.2 for each month (PR card).

TEST DATA 2 - INPUT

T1		HEC-3 RESERVOIR SYSTEM ANALYSIS, TEST DATA 2								
T2		HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS								
T3		JUNE 197[illegible]								
J1	2	1926	7							
J2	0	0	0	3.91	5.5[illegible]	5.02	6.36	4.67	2.42	1.74
[illegible]	0	0								
J9	25000	25000	2[illegible]	25000	25000	25000	25000	25000	25000	25000
J9	25000	25000								
CP	1	2	0							
ID	0	0	0	99999	RESERVOIR A					
RL	.9	156000	0	1						
RL	7	1	-1	1000	350					
RL	6	1	0	1000	156	250	290	330	350.6	350.6
RL					330	321	295	238	156	156
RL	5	1	0	0	143750	214250	219250	274250	285700	289700
RL					280250	267500	246000	205250	143750	143750
RL	4	1	0	100	1315	1765	1945	2185	2268	2268
RL					2225	2140	2010	1725	1315	1315
RL	3	1			119250	142750	152750	162750	167900	167900
RL					164750	165500	156000	139750	119250	119250
RL	2	1	-1	1000	115					
RL	1	1	-1	1000	107					
RS	[illegible]	107[illegible]	1[illegible]	181000	204000	245000	293000	355000	372000	417000
RA	1373	1[illegible]	1[illegible]	1469	1[illegible]70	1495	1517	1543	1549	1560
RE	1020	1320	[illegible]380	1730	1870	2110	2[illegible]	2730	2900	2930
[illegible]	2000	2000	2000	2000	2000	2000	2000	2000	2000	9000
P1	1.15	56000	1225.6	0	0	.660	1	.5		
P2	-.20	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2
P3	-.2	-.2								
CP	2	3	0							
ID	0	0	0	99999	[illegible]					
[illegible]	1	1	0							
[illegible]	3	5	0							
ID	1000	0	0	99999	RESERVOIR B					
LF	2	3	1	1	-1					
[illegible]	1	104000	0	0						
RL	7	3	-1	1000	456					
RL	6	3		1000	115.6	265	340	420	443.1	443.1
RL					420	368	345	265	115.8	115.6
RL	5	3			115750	225400	281450	341450	355975	355975
RL					341650	317650	285[illegible]	21[illegible]	115750	115750
RL	4	3		100	1127	1858	2253	2653	2748.5	2748.5
RL					2633	2473	2258	1758	1127	1127
RL	3	3			109[illegible]	164200	18[illegible]	186950	19[illegible]725	19[illegible]725
RL					184550	176950	166200	141200	109650	109650
RL	1	3	-1	100	1[illegible]6					
RS	[illegible]	1[illegible]	13[illegible]	176000	193000	200000	303000	456000	520000	
RA	1.5[illegible]	2000	22[illegible]	2620	2750	2860	3500	4330	4830	
RE	[illegible]	15[illegible]	15[illegible]	15000	15000	15000	15000	15000	15000	
[illegible]	765	819	[illegible]	849	857	876	890	929	943	
P1	1.15	100000	601	0	0	.66	1	.5		
P2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2	-.2
P3	-.2	-.2								
CP	4	5	0							
ID	0	100	0	99999	RESERVOIR C					
RL	1	10000	0	0						
RL	1	4	-1		10000					
[illegible]	2	4		10000	1	1	1	1	2	2
[illegible]					2	2	2	1	1	1
RL	3	4			10000	22000	28500	33750	44375	44375
RL					40000	33750	27500	13750	10000	10000
RL	4	4			10000	34000	51000	59500	68750	68750
RL					80000	67500	35000	17500	10000	10000
RL	5	4			10000	46000	65500	84250	93125	93125
RL					80000	61250	42500	21250	10000	10000
RL	6	4		1000	10	58	84	109	117.5	117.5
RL					110	75	50	25	10	10
RL	7	4	-1	1000	125					
RS	1000	10000	30000	47830	62000	85000	117500	125000	315000	
RA	250	660	750	970	1200	1500	1600	1890	2970	
RE	5000	5000	5000	5000	5000	5000	5000	5000	5000	
[illegible]	710	726	7[illegible]	760	793.2	810.1	830	830	905	

```
CP      5       6       0
ID      0      -1     100    5000    CONFLUENCE
LF      3       5       1       3      -1       4      -1
DV      3     -.25
QD    100     100     100    2000    4500    4500    4500    4500    4500     100
QD    100     100
CP      6       7       0
ID      0       0       0   99999   DOWNSTREAM
LF      4       1       1       5       1       3      -1       4      -1
CP      7      -1       0
ID      0       0       0   99999   LAST CP
LF      5       4       1       1       1       5       1       3      -1       4
LF     -1
ED
IN    126  1150  2300  1000   745   630   340   235   234   270   365  1440  1635
IN    326  2920  6430  2630  2050  1660   890   615   610   695   970  3880  4520
IN    426   100  1360   640   100   164    82    29    27    38   165  1080  1130
IN    526  3080 11820  3325  2180  1855   997   723   663   808  1232  5245  5960
IN    127  1600  2600  1610  1275  1680  1570   520   345   433   500  2050  1185
IN    327  4360  7150  4320  3140  3620  3320  1420   715  1075  1660  5720  3280
IN    427  1145  1620  1040   576   578   497    95    35    15   320  1410   820
IN    527  7330 11210  5540  3820  4615  4130  1658   759  1095  2280  7370  6150
ER
```

```
*******************************
* RESERVOIR SYSTEM ANALYSIS   *
* 723-X6-L2030   1 JULY 1974  *
*******************************

                    HEC-3 RESERVOIR SYSTEM ANALYSIS, TEST DATA 2
                  HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS
                                     JUNE 1974

 NYRS   IYR    NL TCONS IDVSP IPHPR IDVPR IFLOW JUPDI
    2  1926     7    -0    -0    -0    -0    -0    -0

CLOCL CFLOD IUNIT METRC   CNSTI     CNSTO    CCFS GUNIT  CACFT VUNIT IPRNT  IPHL IPHKW IUPOT IDRST
 1.00  1.00     0     0   1.000     1.000   1.000   CFS  1.000  ACFT     0     0     0     0     0

NPER= 12  IPERA=    1

PERIOD           JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP      OCT      NOV      DEC
NDAYS             31       28       31       30       31       30       31       31       30       31       30       31
EVP               0.       0.       0.     3.91     3.50     5.02     6.36     4.67     2.42     1.74       0.       0.
SYS 1 PWRS   25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0

CONTROL POINT SEQUENCE

*********************************************
* CP NO   1     RESERVOIR A                 *
*********************************************

MONST  MDIV  MRES  MPHR NTSRV  IPRN  NFLW      QDV       QMN       QM2     QMXX
    2     0     1     1     0     0     0       0.        0.        0.   99999.


RESERVOIR DATA*

 INITIAL STOR =   156000.  CEVAP =  .900  QLKG =       0.  ISRCH =    1

                                                * * * S T O R A G E S * * *
                  JAN       FEB       MAR       APR       MAY       JUN       JUL       AUG       SEP       OCT       NOV       DEC
LEVEL   7     356000.   356000.   356000.   356000.   356000.   356000.   356000.   356000.   356000.   356000.   356000.   356000.
LEVEL   6     156000.   250000.   290000.   330000.   350600.   350600.   338000.   321000.   295000.   238000.   156000.   156000.
LEVEL   5     143750.   214250.   214250.   274250.   289700.   289700.   280250.   267500.   248000.   205250.   143750.   143750.
LEVEL   4     131500.   178500.   198500.   218500.   228800.   228800.   222500.   214000.   201000.   172500.   131500.   131500.
LEVEL   3     119250.   142750.   152750.   162750.   167900.   167900.   164750.   160500.   154000.   139750.   119250.   119250.
LEVEL   2     115000.   115000.   115000.   115000.   115000.   115000.   115000.   115000.   115000.   115000.   115000.   115000.
LEVEL   1     107000.   107000.   107000.   107000.   107000.   107000.   107000.   107000.   107000.   107000.   107000.   107000.

STOR           50000.   107000.   148000.   181000.   204000.   241000.   293000.   355000.   372000.   417000.
AREA           1020.0    1320.0    1480.0    1730.0    1870.0    2110.0    2400.0    2730.0    2800.0    2930.0
QCAP            2000.     2000.     2000.     2000.     2000.     2000.     2000.     2000.     2000.     9000.
ELEV          1373.00   1414.00   1444.00   1464.00   1476.00   1495.00   1517.00   1543.00   1548.00   1560.00

POWER DATA*

  OVLOD   PWRMX   TLWEL     IDPR     IPOW    EFFCY   MPSYS   PFMAX
   1.15  50000.  1225.8        0        0     .860       1    .500

POWR            -.20      -.20      -.20      -.20      -.20      -.20      -.20      -.20      -.20      -.20      -.20      -.20
```

```
*********************************************
* CP NO   2   DUMMY                          *
*********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW     QDV       QMN      QM2    QMXX
   3     0     0     0     0     0     1       0.        0.       0.  99999.
MQ AND RTIO=        1   0.

*********************************************
* CP NO   3    RESERVOIR B                   *
*********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW     QDV       QMN      QM2    QMXX
   5     1     1     1     0     0     2    1000.       0.       0.  99999.
MQ AND RTIO=        3   1.000       1  -1.000

RESERVOIR DATA*

 INITIAL STOR =  106600.  CEVAP = 1.000  QLKG =      0.  ISRCH =   0

                                                  * * * S T O R A G E S * * *
                  JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP      OCT      NOV      DEC
LEVEL    7    456000.  156000.  456000.  456000.  456000.  456000.  456000.  456000.  456000.  456000.  456000.  456000.
LEVEL    6    118800.  265000.  380000.  420000.  443100.  443100.  420000.  388000.  345000.  245000.  118800.  118800.
LEVEL    5    115750.  225400.  281650.  341650.  358975.  358975.  341650.  317650.  285400.  210400.  115750.  115750.
LEVEL    4    112700.  185800.  223300.  263300.  274850.  274850.  263300.  247300.  225800.  175800.  112700.  112700.
LEVEL    3    109650.  146200.  164950.  184950.  190725.  190725.  184950.  176950.  166200.  141200.  109650.  109650.
LEVEL    2    106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.
LEVEL    1    106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.

STOR           50000.  106000.  138000.  176000.  190000.  200000.  303000.  456000.  520000.
AREA           1450.0   2000.0   2260.0   2620.0   2750.0   2860.0   3560.0   4330.0   4830.0
QCAP           15000.   15000.   15000.   15000.   15000.   15000.   15000.   15000.   15000.
ELEV           785.00   819.00   834.00   849.00   857.00   874.00   890.00   929.00   943.00

POWER DATA*

  OVLOD   PWRMX    TLWEL     IOPR     IPOW    EFFCY    MPSYS    PFMAX
   1.15 100000.    691.0       0        0      .860       1      .500

POWR             -.20     -.20     -.20     -.20     -.20     -.20     -.20     -.20     -.20     -.20     -.20     -.20

*********************************************
* CP NO   4    RESERVOIR C                   *
*********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW     QDV       QMN      QM2    QMXX
   5     0     1     0     0     0     0       0.      100.       0.  99999.
```

```
RESERVOIR DATA*

 INITIAL STOR =   10000.  CEVAP = 1.000  QLKG =       0.  ISRCH =   0

                                                      * * * S T O R A G E S * * *
                JAN       FEB       MAR       APR       MAY       JUN       JUL       AUG       SEP       OCT       NOV       DEC
LEVEL    7  125000.  125000.  125000.  125000.  125000.  125000.  125000.  125000.  125000.  125000.  125000.  125000.
LEVEL    6   10000.   58000.   84000.  109000.  117500.  117500.  100000.   75000.   50000.   25000.   10000.   10000.
LEVEL    5   10000.   46000.   65500.   84250.   93125.   93120.   80000.   61250.   42500.   21250.   10000.   10000.
LEVEL    4   10000.   34000.   47000.   59500.   68750.   68750.   60000.   47500.   35000.   17500.   10000.   10000.
LEVEL    3   10000.   22000.   28500.   34750.   44375.   44375.   40000.   33750.   27500.   13750.   10000.   10000.
LEVEL    2   10000.   10000.   10000.   10000.   20000.   20000.   20000.   20000.   20000.   10000.   10000.   10000.
LEVEL    1   10000.   10000.   10000.   10000.   10000.   10000.   10000.   10000.   10000.   10000.   10000.   10000.

STOR          4000.    10000.    30000.    47830.    62000.    85000.   117500.   125000.   315000.
AREA          250.0     440.0     750.0     970.0    1200.0    1500.0    1820.0    1890.0    2870.0
QCAP          5000.     5000.     5000.     5000.     5000.     5000.     5000.     5000.     5000.
ELEV         710.00    725.00    760.20    780.00    793.20    810.10    830.00    834.00    905.00

**********************************************
* CP NO   5    CONFLUENCE                    *
**********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW      QDV      QMN      QM2     QMXX
   6     1     0     0     0     0     3      -1.      -1.     100.    5000.
MQ AND RTIO=       5   1.000       3  -1.000       4  -1.000
DIVERSION= -.250 TIMES DIVERSION AT  3
QMIN          100.     100.     100.    2000.    4500.    4500.    4500.    4500.    4500.     100.     100.     100.

**********************************************
* CP NO   6   DOWNSTREAM                     *
**********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW      QDV      QMN      QM2     QMXX
   7     0     0     0     0     0     4       0.       0.       0.   99999.
MQ AND RTIO=       1   1.000       5   1.000       3  -1.000       4  -1.000

**********************************************
* CP NO   7   LAST CP                        *
**********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW      QDV      QMN      QM2     QMXX
  -1     0     0     0     0     0     5       0.       0.       0.   99999.
MQ AND RTIO=       4   1.000       1   1.000       5   1.000       3  -1.000       4  -1.000
```

ANNUAL INPUT DATA FOR 1926

**INFLOWS

STA 1	1150.	2300.	1000.	745.	630.	340.	235.	234.	270.	365.	1440.	1635.
STA 3	2920.	6430.	2630.	2050.	1660.	890.	615.	610.	695.	970.	3880.	4520.
STA 4	100.	1360.	640.	100.	164.	82.	29.	27.	38.	165.	1080.	1130.
STA 5	3080.	11820.	3325.	2180.	1855.	997.	723.	663.	808.	1232.	5245.	5960.

ALL FLOWS IN CFS, STORAGES AND EVAP IN ACFT, AND POWER IN THOUSAND KWH

1 RESERVOIR A LEAKAGE 0. SERVED BY 1
SERVING 1 2 3 5 6 7

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	852.	1150.	2300.	1000.	745.	630.	340.	235.	234.	270.	365.	1440.	1635.
UNREG	852.	1150.	2300.	1000.	745.	630.	340.	235.	234.	270.	365.	1440.	1635.
INFLOW	852.	1150.	2300.	1000.	745.	630.	340.	235.	234.	270.	365.	1440.	1635.
FOP STR		140912	252263	272412	273454	263073	190063	107000	107000	107000	107000	138257	156000
FOP EL		1438.81	1499.77	1508.29	1508.73	1504.34	1468.73	1414.00	1414.00	1414.00	1414.00	1436.87	1448.85
EVAPO	3594.	0.	0.	0.	670.	588.	755.	708.	462.	240.	172.	0.	0.
REQ PWR	87600.	7440.	6720.	7440.	7200.	7440.	7200.	7440.	7440.	7200.	7440.	7200.	7440.
SYS 1	119642.	10120.	9976.	10120.	10600.	9606.	10600.	11851.	9219.	9321.	9788.	9576.	8864.
POWER	124672.	16535.	3547.	10120.	10600.	11928.	21246.	18632.	2308.	2623.	3692.	9576.	15864.
SHORTGE	16630.	0.	3173.	0.	0.	0.	0.	0.	5132.	4577.	3748.	0.	0.
SYS SRT	26133.	0.	6429.	0.	0.	0.	0.	0.	6911.	6697.	6096.	0.	0.
CASE		302	503	102	102	302	302	302	102	102	102	102	103
LEVEL		4.77	6.02	5.77	4.99	4.56	3.36	1.00	1.00	1.00	1.00	4.55	6.00
CSV REL	797.	1395.	295.	672.	716.	789.	1554.	1574.	226.	266.	362.	915.	752.
RIV FLW	847.	1395.	295.	672.	716.	789.	1554.	1574.	226.	266.	362.	915.	1346.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

2 DUMMY LEAKAGE 0. SERVED BY 1

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	852.	1150.	2300.	1000.	745.	630.	340.	235.	234.	270.	365.	1440.	1635.
RIV FLW	847.	1395.	295.	672.	716.	789.	1554.	1574.	226.	266.	362.	915.	1346.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

3 RESERVOIR B LEAKAGE 0. SERVED BY 1 3
SERVING 3 5 6 7
LOCAL DIVERSIONS 3

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	1442.	1770.	4130.	1630.	1305.	1030.	550.	380.	376.	425.	605.	2440.	2885.
UNREG	2294.	2920.	6430.	2630.	2050.	1660.	890.	615.	610.	695.	970.	3880.	4520.
INFLOW	2289.	3165.	4425.	2302.	2021.	1819.	2104.	1954.	602.	691.	967.	3355.	4231.
REQ DIV	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
DIVERSN	936.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	589.8	684.2	962.5	1000.0	1000.0
SHORTGE	64.0	0.	0.	0.	0.	0.	0.	0.	410.2	315.8	37.5	0.	0.

	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
EOP STR		108524	261729	255900	227385	181251	137219	106600	106600	106600	106600	111539	118800
EOP EL		820.18	883.59	882.37	878.25	852.00	833.63	819.28	819.28	819.28	819.28	821.60	825.00
EVAPO	5482.	0.	0.	0.	1025.	634.	1019.	1129.	780.	404.	291.	0.	0.
REQ PWR	175200.	14880.	13440.	14880.	14400.	14880.	14400.	14880.	14880.	14400.	14880.	14400.	14880.
SYS 1	180354.	14880.	15024.	14880.	14400.	15394.	14400.	13149.	15781.	15679.	15212.	15424.	16136.
POWER	127546.	14880.	5342.	14880.	14400.	15394.	14400.	10520.	0.	0.	0.	15424.	22306.
SHORTGE	56618.	0.	8098.	0.	0.	0.	0.	4360.	14880.	14400.	14880.	0.	0.
SYS SRT	58983.	0.	9682.	0.	0.	0.	0.	2629.	15781.	15679.	15212.	0.	0.
CASE		302	503	302	302	302	302	302	302	302	302	302	303
LEVEL		2.63	5.92	4.52	3.54	2.89	2.36	1.00	1.00	1.00	1.00	3.62	6.00
CSV REL	1255.	2134.	666.	1430.	1450.	1556.	1827.	1434.	0.	0.	0.	2272.	2252.
RIV FLW	1328.	2134.	666.	1430.	1450.	1556.	1827.	1434.	0.	0.	0.	2272.	3113.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

****

4 RESERVOIR C LEAKAGE 0. SERVED BY 4
SERVING 4 5 6 7

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	403.	100.	1360.	640.	100.	164.	82.	29.	27.	38.	165.	1080.	1130.
UNREG	403.	100.	1360.	640.	100.	164.	82.	29.	27.	38.	165.	1080.	1130.
INFLOW	403.	100.	1360.	640.	100.	164.	82.	29.	27.	38.	165.	1080.	1130.
EOP STR		10000	'7167	84000	73401	22503	20000	20000	20000	20000	23906	10000	10000
EOP EL		728.00	[illegible].34	809.37	801.58	748.13	744.10	744.10	744.10	744.10	750.39	728.00	728.00
EVAPO	1758.	0.	0.	0.	459.	284.	257.	315.	232.	120.	91.	0.	0.
CASE		401	603	403	501	501	501	401	401	401	401	403	403
LEVEL		1.00	6.29	6.00	4.56	2.10	2.00	2.00	2.00	2.00	5.71	1.00	1.00
CSV REL	169.	100.	54.	100.	270.	987.	120.	24.	23.	36.	100.	100.	100.
RIV FLW	400.	100.	151.	529.	270.	987.	120.	24.	23.	36.	100.	1314.	1130.
DES FLW	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
SHORTGE	18.	0.	0.	0.	0.	0.	0.	76.	77.	64.	0.	0.	0.

****

5 CONFLUENCE LEAKAGE 0. SERVED BY 1 3 4
LOCAL DIVERSIONS 5

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	399.	60.	4030.	55.	30.	31.	25.	79.	26.	75.	97.	285.	310.
UNREG	3095.	3080.	11820.	3325.	2180.	1855.	997.	723.	663.	808.	1232.	5245.	5960.
INFLOW	2128.	2294.	4847.	2014.	1750.	2574.	1972.	1537.	49.	111.	197.	3070.	4553.
REQ DIV	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0
DIVERSN	-234.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-147.4	-171.0	-240.6	-250.0	-250.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	2362.	2544.	5097.	2264.	2000.	2824.	2222.	1787.	197.	282.	438.	4120.	4803.
DES FLW	2101.	100.	100.	100.	2000.	4500.	4500.	4500.	4500.	4500.	100.	100.	100.
SHORTGE	1272.	0.	0.	0.	0.	1676.	2278.	2713.	4303.	4218.	0.	0.	0.
MIN FLW	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

****

6 DOWNSTREAM LEAKAGE 0. SERVED BY 1 3 4
LOCAL DIVERSIONS 5

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	1251.	1210.	6330.	1055.	775.	661.	365.	314.	260.	345.	462.	1725.	1945.
UNREG	3947.	4230.	14120.	4325.	2925.	2485.	1337.	958.	897.	1078.	1597.	6685.	7595.
RIV FLW	3214.	3694.	7397.	3264.	2745.	3454.	2562.	2022.	431.	552.	803.	5560.	6438.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

****

7 LAST CP LEAKAGE 0. SERVED BY 1 3 4
LOCAL DIVERSIONS 5

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	1654.	1310.	7690.	1695.	875.	825.	447.	343.	287.	383.	627.	2605.	3075.
UNREG	4350.	4330.	15480.	4965.	3025.	2649.	1419.	987.	924.	1116.	1762.	7765.	8725.
RIV FLW	3616.	3794.	8757.	3904.	2845.	3618.	2644.	2051.	458.	590.	968.	6640.	7568.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

SYSTEM 1 POWER SUMMARY

SYSTEM TOTAL													
REQUIPD	300000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.
USABLE	250940.	31415.	8889.	25000.	25000.	27322.	32400.	29120.	2308.	2623.	3692.	25000.	38171.
TOTAL	254216.	31415.	8889.	25000.	25000.	27322.	35646.	29151.	2308.	2623.	3692.	25000.	38171.
SHORTGE	86848.	0.	16111.	0.	0.	0.	0.	4360.	22692.	22377.	21308.	0.	0.

ANNUAL INPUT DATA FOR 1927
**INFLOWS

STA 1	1600.	2600.	1610.	1275.	1680.	1570.	520.	345.	433.	500.	2050.	1185.
STA 3	4360.	7150.	4320.	3140.	3620.	3320.	1420.	715.	1075.	1660.	5720.	3280.
STA 4	1145.	1620.	1040.	576.	578.	497.	95.	35.	15.	320.	1410.	820.
STA 5	7330.	11210.	5540.	3820.	4615.	4130.	1658.	759.	1095.	2280.	7370.	6150.

ALL FLOWS IN CFS, STORAGES AND EVAP IN ACFT, AND POWER IN THOUSAND KWH

++

1 RESERVOIR A LEAKAGE 0. SERVED BY 1
SERVING 1 2 3 5 6 7

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	1269.	1600.	2600.	1610.	1275.	1680.	1570.	520.	345.	433.	500.	2050.	1185.
UNREG	1269.	1600.	2600.	1610.	1275.	1680.	1570.	520.	345.	433.	500.	2050.	1185.
INFLOW	1269.	1600.	2600.	1610.	1275.	1680.	1570.	520.	345.	433.	500.	2050.	1185.
EOP STR		184253	277767	290000	326217	350600	350600	338000	321000	295000	238000	288432	300026
EOP EL		1465.70	1510.56	1515.73	1530.93	1541.15	1541.15	1535.87	1528.74	1517.84	1493.46	1515.07	1519.95
EVAPO	5367.	0.	0.	0.	727.	693.	1019.	1275.	909.	450.	294.	0.	0.
REQ PWR	87600.	7440.	6720.	7440.	7200.	7440.	7200.	7440.	7440.	7200.	7440.	7200.	7440.
SYS 1	113485.	9199.	9553.	8940.	10195.	10120.	10600.	9288.	8875.	9639.	10075.	8308.	8693.
POWER	195638.	14306.	11834.	21958.	10195.	21374.	25665.	11926.	10071.	13446.	21566.	17557.	15742.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SYS SRT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CASE		503	503	103	102	103	103	103	103	103	103	503	503
LEVEL		6.14	6.26	6.00	5.93	6.00	6.00	6.00	6.00	6.00	6.00	6.66	6.72
CSV REL	732.	733.	740.	575.	654.	602.	900.	704.	607.	862.	1288.	569.	550.
RIV FLW	1063.	1141.	916.	1411.	654.	1272.	1553.	704.	607.	862.	1422.	1202.	996.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

2 DUMMY LEAKAGE 0. SERVED BY 1

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNREG	1269.	1600.	2600.	1610.	1275.	1680.	1570.	520.	345.	433.	500.	2050.	1185.
RIV FLW	1063.	1141.	916.	1411.	654.	1272.	1553.	704.	607.	862.	1422.	1202.	996.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

3 RESERVOIR B LEAKAGE 0. SERVED BY 1 3
SERVING 3 5 6 7
LOCAL DIVERSIONS 3

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	2014.	2760.	4550.	2710.	1865.	1940.	1750.	900.	370.	642.	1160.	3670.	2095.
UNREG	3283.	4360.	7150.	4320.	3140.	3620.	3320.	1420.	715.	1075.	1660.	5720.	3280.
INFLOW	3077.	3901.	5466.	4121.	2519.	3212.	3303.	1604.	977.	1504.	2582.	4872.	3091.
REQ DIV	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
DIVERSN	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

FOP STR		149878	293962	340000	349051	406000-	443100	399848	310334	250072	245000	238060	219415
FOP EL		838.69	688.60	899.43	901.74	916.25	925.71	914.69	891.87	881.78	880.99	879.91	877.02
EVAPC	8729.	0.	C.	0.	1230.	1191.	1745.	2191.	1481.	640.	462.	0.	0.
REQ PWR	175200.	14880.	13440.	14880.	14400.	14880.	14400.	14880.	14880.	14400.	14680.	14400.	14880.
SYS 1	186515.	18801.	15447.	16060.	14805.	14880.	14400.	15712.	16125.	15361.	14925.	16692.	16307.
POWER	239194.	18326.	17067.	26024.	14805.	14880.	19888.	15712.	16125.	15361.	17087.	39607.	24312.
SHORTGE	0.	0.	C.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SYS SRT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CASE		503	5C3	303	302	302	303	302	302	302	303	503	503
LEVEL		6.09	6.15	6.00	5.09	5.56	6.00	5.74	4.90	4.41	6.00	6.35	6.30
CSV REL	1533.	2065.	1694.	1464.	1346.	1267.	1650.	1272.	1408.	1506.	1448.	1681.	1606.
RIV FLW	1926.	2395.	1872.	2372.	1346.	1267.	1650.	1272.	1408.	1506.	1657.	3989.	2395.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

4 RESERVOIR C LEAKAGE 0. SERVED BY 4

SERVING 4 5 6 7

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	672.	1145.	1620.	1040.	576.	578.	497.	95.	35.	15.	320.	1410.	820.
UNREG	672.	1145.	162C.	1040.	576.	578.	497.	95.	35.	15.	320.	1410.	820.
INFLOW	672.	1145.	1620.	1040.	576.	578.	497.	95.	35.	15.	320.	1410.	820.
FOP STR		34692	87044	84000	99935	70759	76260	50431	29455	20927	25000	56133	67083
FOP EL		765.41	811.35	809.37	819.24	799.64	803.68	782.42	759.32	745.59	752.15	787.73	796.93
EVAPC	2727.	0.	0.	0.	509.	439.	565.	645.	340.	136.	93.	0.	0.
CASE		603	6C3	403	501	501	501	501	501	501	403	603	603
LEVEL		6.21	6.43	6.00	5.63	4.08	4.31	3.52	2.69	2.12	6.00	6.40	6.50
CSV REL	243.	100.	10C.	100.	300.	1045.	395.	505.	371.	156.	100.	100.	100.
RIV FLW	590.	743.	677.	1090.	300.	1045.	395.	505.	371.	156.	252.	887.	642.
DES FLW	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

5 CONFLUENCE LEAKAGE 0. SERVED BY 1 3 4

LOCAL DIVERSIONS 5

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	660.	1825.	2440.	180.	104.	417.	313.	143.	9.	5.	300.	240.	2050.
UNREG	4615.	7330.	11210.	5540.	3820.	4615.	4130.	1658.	759.	1095.	2280.	7370.	6150.
INFLOW	3175.	4963.	4989.	3642.	1750.	2730.	2358.	1920.	1788.	1667.	2209.	5116.	5087.
REQ DIV	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0
DIVERSN	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	3425.	9213.	5239.	3892.	2000.	2980.	2608.	2170.	2038.	1917.	2459.	5366.	5337.
DES FLW	2101.	100.	10C.	100.	2000.	4500.	4500.	4500.	4500.	4500.	100.	100.	100.
SHORTGE	904.	0.	C.	0.	0.	1520.	1892.	2330.	2462.	2583.	0.	0.	0.
MIN FLW	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

6 DOWNSTREAM LEAKAGE 0. SERVED BY 1 3 4
LOCAL DIVERSIONS 5

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	1929.	3425.	5040.	1790.	1379.	2097.	1883.	663.	354.	438.	800.	2290.	3235.
UNREG	5385.	8930.	13810.	7150.	5095.	6295.	5700.	2178.	1104.	1528.	2780.	9420.	7335.
RIV FLW	4694.	6813.	7839.	5502.	3275.	4660.	4178.	2690.	2383.	2350.	2959.	7416.	6522.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

7 LAST CP LEAKAGE 0. SERVED BY 1 3 4
LOCAL DIVERSIONS 5

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	2601.	4570.	6660.	2830.	1955.	2675.	2380.	758.	389.	453.	1120.	3700.	4055.
UNREG	6597.	10075.	15430.	8190.	5671.	6873.	6197.	2273.	1139.	1543.	3100.	10830.	8155.
RIV FLW	5367.	7958.	9459.	6542.	3851.	5238.	4675.	2785.	2418.	2365.	3279.	8826.	7342.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

SYSTEM 1 POWER SUMMARY

SYSTEM TOTAL													
REQUIRD	300000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.
USABLE	414462.	32631.	28901.	44624.	25000.	33480.	37888.	27638.	26196.	28806.	35687.	53557.	40053.
TOTAL	434633.	32631.	28901.	47982.	25000.	36254.	45554.	27638.	26196.	28806.	38652.	57165.	40053.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

AVERAGES FOR PERIOD OF OPERATION 1926 - 1927

1 RESERVOIR A

LOC FLW	1061.
UNREG	1061.
INFLOW	1061.
EVAPO	4481.
REQ PWR	87600.
SYS 1	116564.
POWER	161155.
SHORTGE	8315.
CSV REL	764.
RIV FLW	955.
DES FLW	0.
SHORTGE	0.

2 DUMMY

LOC FLW	0.
UNREG	1061.
RIV FLW	955.
DES FLW	0.
SHORTGE	0.

```
 3    RESERVOIR B

LOC FLW    1728.
UNREG      2789.
INFLOW     2683.
REQ DIV  1000.0
DIVERSN   968.0
SHORTGE    32.0
EVAPO      7205.
REQ PWR  175200.
SYS   1  183436.
POWER    183370.
SHORTGE   28309.

CSV REL    1394.
RIV FLW    1627.
DES FLW       0.
SHORTGE       0.

 4    RESERVOIR C

LOC FLW     537.
UNREG       537.
INFLOW      537.
EVAPO      2242.

CSV REL     226.
RIV FLW     495.
DES FLW     100.
SHORTGE       9.

 5    CONFLUENCE

LOC FLW     529.
UNREG      3855.
INFLOW     2651.
REQ DIV  -250.0
DIVERSN  -242.0
SHORTGE      0.
RIV FLW    2893.
DES FLW    2101.
SHORTGE    1088.
MIN FLW     100.
SHORTGE       0.

 6    DOWNSTREAM

LOC FLW    1590.
UNREG      4916.
RIV FLW    3954.
DES FLW       0.
SHORTGE       0.

 7    LAST CP

LOC FLW    2127.
UNREG      5453.
RIV FLW    4491.
DES FLW       0.
SHORTGE       0.
```

DIVERSION SHORTAGE INDEX 3 .205 5 -1.000

POWER SHORTAGE INDEX 1 1.802 3 5.222
POWER SYSTEM 1 SHORTAGE INDEX 4.190 NO. OF SHORTAGES 5 MAX. SHORTAGE = 22692.

DES FLOW SHORTAGE INDEX 1 -1.000 2 -1.000 3 -1.000 4 1.665 5 27.600 6 -1.000 7 -1.000

MIN FLOW SHORTAGE INDEX 1 -1.000 2 -1.000 3 -1.000 4 -1.000 5 0. 6 -1.000 7 -1.000

	DIVRSION SHORTAGES		DES FLOW SHORTAGES		MIN FLOW SHORTAGES		SYS PWR SHORTAGES		AT SITE PWR SHRTGS	
STA	NO	MAX	NO	MAX	NO	MAX	NO	MAX	NO	MAX
1	-	-	0	0.	0	0.	4	6911.	4	5132.
2	-	-	0	0.	0	0.	0	0.	0	0.
3	3	410.	0	0.	0	0.	5	15781.	5	14880.
4	-	-	3	77.	0	0.	0	0.	0	0.
5	-	-	10	4303.	0	0.	0	0.	0	0.
6	-	-	0	0.	0	0.	0	0.	0	0.
7	-	-	0	0.	0	0.	0	0.	0	0.

STORAGE FREQUENCY PER 2 YEARS AT LOCATION 1

CONS POOL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
99-100 PCT	1	2	1	0	1	1	1	1	1	1	1	2
95- 99 PCT	0	0	0	1	0	0	0	0	0	0	0	0
90- 95 PCT	0	0	1	0	0	0	0	0	0	0	0	0
80- 90 PCT	0	0	0	0	0	0	0	0	0	0	0	0
70- 80 PCT	0	0	0	1	0	0	0	0	0	0	0	0
60- 70 PCT	1	0	0	0	1	0	0	0	0	0	1	0
40- 60 PCT	0	0	0	0	0	0	0	0	0	0	0	0
20- 40 PCT	0	0	0	0	0	1	0	0	0	0	0	0
1- 20 PCT	0	0	0	0	0	0	0	0	0	0	0	0
0- 1 PCT	0	0	0	0	0	0	1	1	1	1	0	0

STORAGE FREQUENCY PER 2 YEARS AT LOCATION 3

CONS POOL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
99-100 PCT	1	1	1	0	0	1	0	0	0	1	1	2
95- 99 PCT	0	1	0	0	0	1	0	0	0	0	1	0
90- 95 PCT	0	0	0	0	0	0	1	0	0	0	0	0
80- 90 PCT	0	0	0	0	1	0	0	0	0	0	0	0
70- 80 PCT	0	0	0	1	0	0	0	1	0	0	0	0
60- 70 PCT	0	0	1	0	0	0	0	0	1	0	0	0
40- 60 PCT	0	0	0	0	0	0	0	0	0	0	1	0
20- 40 PCT	0	0	0	1	1	0	0	0	0	0	0	0
1- 20 PCT	1	0	0	0	0	1	0	0	0	0	0	0
0- 1 PCT	0	0	0	0	0	0	1	1	1	1	0	0

STORAGE FREQUENCY PER 2 YEARS AT LOCATION 4

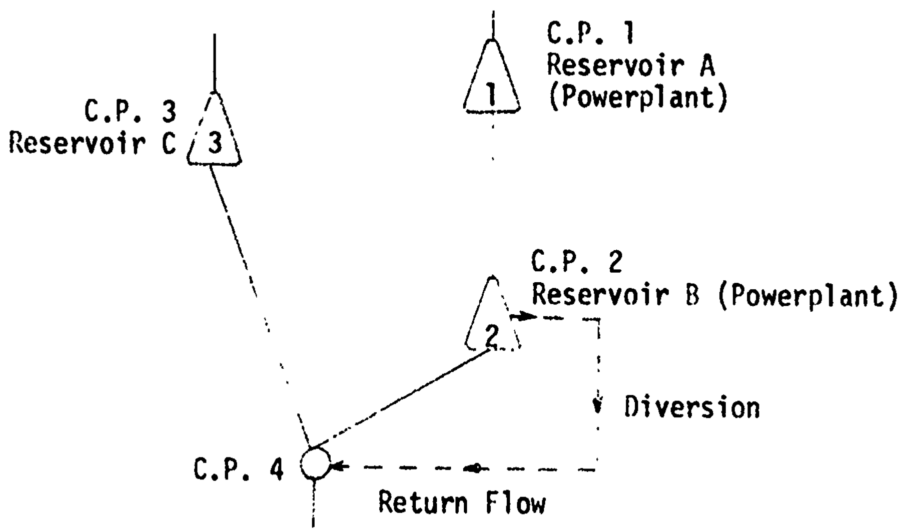
CONS POOL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
99-100 PCT	2	2	2	0	0	0	0	0	0	1	2	2
95- 99 PCT	0	0	0	0	0	0	0	0	0	0	0	0
90- 95 PCT	0	0	0	1	0	0	0	0	0	1	0	0
80- 90 PCT	0	0	0	0	0	0	0	0	0	0	0	0
70- 80 PCT	0	0	0	0	0	0	0	0	0	0	0	0
60- 70 PCT	0	0	0	1	0	1	0	0	0	0	0	0
40- 60 PCT	0	0	0	0	1	0	1	0	0	0	0	0
20- 40 PCT	0	0	0	0	0	0	0	1	2	0	0	0
1- 20 PCT	0	0	0	0	1	1	1	1	0	0	0	0
0- 1 PCT	0	0	0	0	0	0	0	0	0	0	0	0

EXHIBIT 2

TEST DATA 3 - DESCRIPTION

General

The reservoir system for Test Data 3 is very similar to that of Test 2. There are three reservoirs, including two with powerplants, and one downstream control point. The primary differences are a reduction in the number and renumbering of the control points, a renumbering of the flow stations, and the addition of economic data by use of EC, BN, BP and BV cards.



TEST DATA 3 - INPUT

```
T1                HEC-3 RESERVOIR SYSTEM ANALYSIS, TEST DATA 3
T2             HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS
T3                                 JUNE 1974
J1     2    1926       7
J8     0       0       0    3.91    3.50    5.02    6.36    4.67    2.42    1.74
J8     0       0
J9 25000   25000   25000   25000   25000   25000   25000   25000   25000   25000
J9 25000   25000
CP     1       2       0
ID     0       0       0   99999   RESERVOIR A
EC     0       0       2       3       0       0       0       0
R1     5  156000       0       1
RL     7       1      -1    1000     356
RL     6       1       0    1000     156     250     290     330   350.6   350.6
RL                                   338     321     295     238     156     156
RL     5       1       0       0  143750  214250  214250  274250  289700  289700
RL                                280250  267500  248000  205250  143750  143750
RL     4       1       0     100    1315    1785    1985    2185    2288    2288
RL                                  2225    2140    2010    1725    1315    1315
RL     3       1                  119250  142750  152750  162750  167900  167900
RL                                164750  160500  154000  139750  119250  119250
RL     2       1      -1    1000     115
RL     1       1      -1    1000     107
RS 50000  107000  148000  181000  204000  241000  293000  355000  372000  417000
RE  1373    1414    1444    1464    1476    1495    1517    1543    1548    1560
RA  1020    1320    1480    1730    1870    2110    2400    2730    2800    2930
RQ  2000    2000    2000    2000    2000    2000    2000    2000    2000    9000
P1  1.15   50000  1225.8       0       0    .060       1      .5
PR  -.20     -.2     -.2     -.2     -.2     -.2     -.2     -.2     -.2     -.2
PR   -.2     -.2
CP     2       4       0
ID  1000       0       0   99999   RESERVOIR B
LF     2       2       1       1      -1
EC     0       0       2       3       4       0       0       0
R1     1  106600       0       0
RL     7       2      -1    1000     456
RL     6       2            1000   118.8     265     340     420   443.1   443.1
RL                                   420     388     345     245   118.8   118.8
RL     5       2                  115750  225400  281650  341650  358975  358975
RL                                341650  317650  285400  210400  115750  115750
RL     4       2             100    1127    1858    2233    2633  2748.5  2748.5
RL                                  2633    2473    2258    1758    1127    1127
RL     3       2                  109650  146200  164950  184950  190725  190725
RL                                184950  176950  166200  141200  109650  109650
RL     1       2      -1     100    1066
RS 50000  106000  138000  176000  190000  200000  303000  456000  520000
RA  1450    2000    2260    2620    2750    2860    3560    4330    4830
RQ 15000   15000   15000   15000   15000   15000   15000   15000   15000
RF   785     819     834     849     857     874     890     929     943
P1  1.15  100000     691       0       0     .86       1      .5
PR   -.2     -.2     -.2     -.2     -.2     -.2     -.2     -.2     -.2     -.2
PR   -.2     -.2
CP     3       4       0
ID     0     100       0   99999   RESERVOIR C
EC     0       1       2       0       0       0       0       0
R1     1   10000       0       0
RL     1       3      -1           10000
RL     2       3           10000       1       1       1       1       2       2
RL                                     2       2       2       1       1       1
RL     3       3                   10000   22000   28500   34750   44375   44375
RL                                 40000   33750   27500   13750   10000   10000
RL     4       3                   10000   34000   47000   59500   68750   68750
RL                                 60000   47500   35000   17500   10000   10000
RL     5       3                   10000   46000   65500   84250   93125   93120
RL                                 80000   61250   42500   21250   10000   10000
RL     6       3            1000      10      58      84     109   117.5   117.5
RL                                   100      75      50      25      10      10
RL     7       3      -1    1000     125
RS  4000   10000   30000   47830   62000   85000  117500  125000  315000
RA   250     440     750     970    1200    1500    1820    1890    2870
RQ  5000    5000    5000    5000    5000    5000    5000    5000    5000
RE   710     728   760.2     780   793.2   810.1     830     834     905
```

```
CP     4      -1        0
ID     0      -1      100     5000    CONFLUENCE
LF     3       4        1        1       -1        3        -1
EC     1       1        0        0        0        0         0        0
DV     2     -.25
QD   100     100      100     2000     4500     4500      4500     4500     4500      100
QD   100     100
ED
IN   126   1150  2300  1000   745   630   340   235   234   270   365  1440  1635
IN   226   2920  6430  2630  2050  1660   890   615   610   695   970  3880  4520
IN   326    100  1360   640   100   164    82    29    27    38   165  1080  1130
IN   426   3080 11820  3325  2180  1855   997   723   663   808  1232  5245  5960
IN   127   1600  2600  1610  1275  1680  1570   520   345   433   500  2050  1185
IN   227   4360  7150  4320  3140  3620  3320  1420   715  1075  1660  5720  3280
IN   327   1145  1620  1040   574   578   497    95    35    15   320  1410   820
IN   427   7330 11210  5540  3820  4615  4130  1658   759  1095  2280  7370  6150
BN      QUALITY CONTROL
BN      FISH
BN      RECREATION
BN      POWER
BN      WATER SUPPLY
BN
BN
BN
BP 1   4      12       0     2000     2000       0       0       0       0       0
BV 1   4      12     -50       50       50       0       0       0       0       0
BP 2   3      12       0      100      100       0       0       0       0       0
BV 2   3      12     -20       20       20       0       0       0       0       0
BP 2   4      12       0      100      100       0       0       0       0       0
BV 2   4      12     -40       40       40       0       0       0       0       0
BP 3   1       4       0   356000        0       0       0       0       0       0
BV 3   1       4       0        0        0       0       0       0       0       0
BP 3   1       9       0   150000   356000       0       0       0       0       0
BV 3   1       9       0        0       50       0       0       0       0       0
BP 3   1      12       0   356000        0       0       0       0       0       0
BV 3   1      12       0        0        0       0       0       0       0       0
BP 3   2       4       0   456000        0       0       0       0       0       0
BV 3   2       4       0        0        0       0       0       0       0       0
BP 3   2       9       0   200000   456000       0       0       0       0       0
BV 3   2       9       0        0       70       0       0       0       0       0
BP 3   2      12       0   456000        0       0       0       0       0       0
BV 3   2      12       0        0        0       0       0       0       0       0
BP 3   3       4       0   125000        0       0       0       0       0       0
BV 3   3       4       0        0        0       0       0       0       0       0
BP 3   3       9       0    50000   125000       0       0       0       0       0
BV 3   3       9       0        0       30       0       0       0       0       0
BP 3   3      12       0   125000        0       0       0       0       0       0
BV 3   3      12       0        0        0       0       0       0       0       0
BP 4   1      12       0     4000    25000       0       0       0       0       0
BV 4   1      12    -200       12       24       0       0       0       0       0
BP 4   2      12       0    16000   100000       0       0       0       0       0
BV 4   2      12    -800       48       96       0       0       0       0       0
BP 5   2       3       0        9        0       0       0       0       0       0
BV 5   2       3       0        0        0       0       0       0       0       0
BP 5   2       4       0        8       16       0       0       0       0       0
BV 5   2       4     -20        0        4       0       0       0       0       0
BP 5   2       5       0       75      149       0       0       0       0       0
BV 5   2       5    -140        0       35       0       0       0       0       0
BP 5   2       6       0      160      317       0       0       0       0       0
BV 5   2       6    -320        0       80       0       0       0       0       0
BP 5   2       7       0      250      508       0       0       0       0       0
BV 5   2       7    -480        0      120       0       0       0       0       0
BP 5   2       8       0      200      397       0       0       0       0       0
BV 5   2       8    -400        0      100       0       0       0       0       0
BP 5   2       9       0       70      134       0       0       0       0       0
BV 5   2       9    -160        0       40       0       0       0       0       0
BP 5   2      12       0        9        0       0       0       0       0       0
BV 5   2      12       0        0        0       0       0       0       0       0
ER
```

```
********************************
* RESERVOIR SYSTEM ANALYSIS    *
* 723-X6-L2030    1 JULY 1974  *
********************************

                    HEC-3 RESERVOIR SYSTEM ANALYSIS, TEST DATA 3
                  HYDROLOGIC ENGINEERING CENTER, CORPS OF ENGINEERS
                                     JUNE 1974

 NYRS   IYR     NL  ICONS IDVSP IPWPR IDVPR IPLOW JUPQI
    2  1926      7    -0    -0    -0    -0    -0    -0

CLOCL CFLOD IUNIT METRC   CNSTI      CNSTO       CCFS QUNIT   CACFT VUNIT IPRNT  IPRL IPWKH IUPOT IDGST
 1.00  1.00     0     0   1.000      1.000      1.000   CFS   1.000  ACFT     0     0     0     0     0

NPER= 12  IPEMAX=    1

PERIOD          JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP      OCT      NOV      DEC
NDAYS            31       28       31       30       31       30       31       31       30       31       30       31
FVP              0.       0.       0.     3.91     3.50     5.02     6.36     4.67     2.42     1.74       0.       0.
SYS 1 PWRS  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0  25000.0

CONTROL POINT SEQUENCE

*********************************************
* CP NO    1     RESERVOIR A                *
*********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW     QDV      QMN      QM2    QMXX
    2     0     1     1     0     0     0      0.       0.       0.  99999.

IE(1)= 0  IE(2)= 0  IE(3)= 2  IE(4)= 3  IE(5)= 0  IE(6)= 0  IE(7)= 0  IE(8)= 0

RESERVOIR DATA*

 INITIAL STOR =  156000.  CEVAP =  .900  QLKG =       0.  ISRCH =    1

                                                   * * * S T O R A G E S * * *
                JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP      OCT      NOV      DEC
LEVEL   7   356000.  356000.  356000.  356000.  356000.  356000.  356000.  356000.  356000.  356000.  356000.  356000.
LEVEL   6   156000.  250000.  290000.  330000.  350600.  350600.  338000.  321000.  295000.  238000.  156000.  156000.
LEVEL   5   143750.  214250.  214250.  274250.  289700.  289700.  280250.  267500.  248000.  205250.  143750.  143750.
LEVEL   4   131500.  178500.  198500.  218500.  228800.  228800.  222500.  214000.  201000.  172500.  131500.  131500.
LEVEL   3   119250.  142750.  152750.  162750.  167900.  167900.  164750.  160500.  154000.  139750.  119250.  119250.
LEVEL   2   115000.  115000.  115000.  115000.  115000.  115000.  115000.  115000.  115000.  115000.  115000.  115000.
LEVEL   1   107000.  107000.  107000.  107000.  107000.  107000.  107000.  107000.  107000.  107000.  107000.  107000.

STOR         50000.  107000.  148000.  181000.  204000.  241000.  293000.  355000.  372000.  417000.
AREA         1020.0   1320.0   1480.0   1730.0   1870.0   2110.0   2400.0   2730.0   2800.0   2930.0
QCAP          2000.    2000.    2000.    2000.    2000.    2000.    2000.    2000.    2000.    9000.
FLEV        1373.00  1414.00  1444.00  1464.00  1475.00  1495.00  1517.00  1543.00  1548.00  1560.00

POWER DATA*

  OVLOD  PWRMX   TLWEL     IDPR     IPOW   EFFCY    MPSYS    PFMAX
   1.15  50000.  1225.8       0        0    .860        1     .500

POWR           -.20     -.20     -.20     -.20     -.20     -.20     -.20     -.20     -.20     -.20     -.20     -.20
```

```
***********************************************
* CP NO   2    RESERVOIR D                    *
***********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW     QDV      QMN      QM2    QMXX
   4     1     1     1     0     0     2   1000.       0.       0.   99999.
MO AND RTIO=       2  1.000        1  -1.000

IE(1)= 0  IE(2)= 0  IE(3)= 2  IE(4)= 3  IE(5)= 4  IE(6)= 0  IE(7)= 0  IE(8)= 0

RESERVOIR DATA*

 INITIAL STOR =  106600.  CEVAP = 1.000  QLKG =      0.  ISRCH =   0

                                          * * * S T O R A G E S * * *
                 JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP      OCT      NOV      DEC
LEVEL   7   456000.  456000.  456000.  456000.  456000.  456000.  456000.  456000.  456000.  456000.  456000.  456000.
LEVEL   6   118800.  265000.  340000.  420000.  443100.  443100.  420000.  388000.  345000.  245000.  118800.  118800.
LEVEL   5   115750.  225400.  281650.  341650.  358975.  358975.  341650.  317650.  285900.  210400.  115750.  115750.
LEVEL   4   112700.  185800.  223300.  263300.  274850.  274850.  263300.  247300.  225800.  175800.  112700.  112700.
LEVEL   3   109650.  146200.  164950.  184950.  190725.  190725.  184950.  176950.  166200.  141200.  109650.  109650.
LEVEL   2   106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.
LEVEL   1   106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.  106600.

STOR         50000.   106000.   138000.   176000.   190000.   200000.   303000.   456000.   520000.
AREA         1450.0   2000.0    2260.0    2620.0    2750.0    2860.0    3560.0    4330.0    4830.0
QCAP         15000.   15000.    15000.    15000.    15000.    15000.    15000.    15000.    15000.
ELEV         785.00   819.00    834.00    849.00    857.00    874.00    890.00    929.00    943.00

POWER DATA*

  OVLOD   PWRMX    TLWEL     IOPR      IPOW    EFFCY    MPSYS    PFMAX
   1.15 100000.    691.0        0         0     .860        1     .500

POWR          -.20      -.20      -.20      -.20      -.20      -.20      -.20      -.20      -.20      -.20      -.20      -.20

***********************************************
* CP NO   3    RESERVOIR C                    *
***********************************************

MONST  MDIV  MRES  MPWR NTSRV  IPRN  NFLW     QDV      QMN      QM2    QMXX
   4     0     1     0     0     0     0       0.     100.       0.   99999.

IE(1)= 0  IE(2)= 1  IE(3)= 2  IE(4)= 0  IE(5)= 0  IE(6)= 0  IE(7)= 0  IE(8)= 0

RESERVOIR DATA*

 INITIAL STOR =   10000.  CEVAP = 1.000  QLKG =      0.  ISRCH =   0

                                          * * * S T O R A G E S * * *
                 JAN      FEB      MAR      APR      MAY      JUN      JUL      AUG      SEP      OCT      NOV      DEC
LEVEL   7   125000.  125000.  125000.  125000.  125000.  125000.  125000.  125000.  125000.  125000.  125000.  125000.
LEVEL   6    10000.   58000.   84000.  109000.  117500.  117500.  100000.   75000.   50000.   25000.   10000.   10000.
LEVEL   5    10000.   46000.   65500.   84250.   93125.   93120.   80000.   61250.   42500.   21250.   10000.   10000.
LEVEL   4    10000.   34000.   47000.   59500.   68750.   68750.   60000.   47500.   35000.   17500.   10000.   10000.
LEVEL   3    10000.   22000.   28500.   34750.   44375.   44375.   40000.   33750.   27500.   13750.   10000.   10000.
LEVEL   2    10000.   10000.   10000.   10000.   20000.   20000.   20000.   20000.   20000.   10000.   10000.   10000.
LEVEL   1    10000.   10000.   10000.   10000.   10000.   10000.   10000.   10000.   10000.   10000.   10000.   10000.

STOR          4000.   10000.    30000.    47830.    62000.    85000.   117500.   125000.   315000.
AREA          250.0    440.0    750.0     970.0     1200.0    1500.0    1820.0    1890.0    2870.0
QCAP          5000.    5000.    5000.     5000.     5000.     5000.     5000.     5000.     5000.
ELEV         710.00   728.00   760.20    780.00    793.20    810.10    830.00    834.00    905.00
```

```
*************************************************
* CP NO   4    CONFLUENCE                        *
*************************************************

MONST  NDIV  NRES  NPWR  NTSRV  IPRN  NFLW     QDV      QPN      QM2     QMXX
   -1     1     0     0      0     0     3     -1.      -1.     100.    5000.
MQ AND RTIO=        4   1.000         1  -1.000         3  -1.000

IE(1)= 1  IE(2)= 1  IE(3)= 0  IE(4)= 0  IE(5)= 0  IE(6)= 0  IE(7)= 0  IE(8)= 0
DIVERSION= -.250 TIMES DIVERSION AT  2
QMIN            100.    100.    100.   2000.   4500.   4500.   4500.   4500.   4500.    100.    100.    100.
```

ANNUAL INPUT DATA FOR 1926

**INFLOWS

STA 1	1150.	2300.	1000.	745.	630.	340.	235.	234.	270.	365.	1440.	1635.
STA 2	2920.	6430.	2630.	2050.	1660.	890.	615.	610.	695.	970.	3880.	4520.
STA 3	100.	1360.	640.	100.	164.	82.	29.	27.	36.	165.	1080.	1130.
STA 4	3080.	11820.	3325.	2180.	1855.	997.	723.	663.	808.	1232.	5245.	5960.

ALL FLOWS IN CFS, STORAGES AND EVAP IN ACFT, AND POWER IN THOUSAND KWH

****

1 RESERVOIR A LEAKAGE 0. SERVED BY 1

SERVING 1 2 4

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	852.	1150.	2300.	1000.	745.	630.	340.	235.	234.	270.	365.	1440.	1635.
UNREG	852.	1150.	2300.	1000.	745.	630.	340.	235.	234.	270.	365.	1440.	1635.
INFLOW	852.	1150.	2300.	1000.	745.	630.	340.	235.	234.	270.	365.	1440.	1635.
EOP STR		190912	268647	289840	291972	290459	228221	125905	107000	107000	107000	156274	221338
EOP EL		1438.81	1506.70	1515.66	1516.57	1515.92	1488.44	1427.83	1414.00	1414.00	1414.00	1449.01	1484.90
EVAPO	3854.	0.	0.	0.	699.	626.	830.	812.	475.	240.	172.	0.	0.
REQ PWR	87600.	7440.	6720.	7440.	7200.	7440.	7200.	7440.	7440.	7200.	7440.	7200.	7440.
SYS 1	121908.	10120.	11136.	10120.	10600.	10120.	10600.	11396.	10610.	9321.	9788.	9576.	8520.
POWER	117485.	14535.	0.	10120.	10600.	10120.	19872.	24095.	5640.	2623.	3692.	6620.	7568.
SHORTGE	17425.	0.	6720.	0.	0.	0.	0.	0.	1800.	4577.	3748.	580.	0.
SYS SRT	32808.	0.	11136.	0.	0.	0.	0.	0.	4971.	6697.	6096.	2956.	951.
CASE		202	403	102	102	102	202	202	102	102	102	403	403
LEVEL		4.77	6.18	6.00	5.32	5.01	3.99	2.22	1.00	1.00	1.00	6.00	6.33
CSV REL	756.	1395.	0.	655.	697.	644.	1372.	1886.	534.	266.	362.	612.	577.
RIV FLW	756.	1395.	0.	655.	697.	644.	1372.	1886.	534.	266.	362.	612.	577.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

****

2 RESERVOIR B LEAKAGE 0. SERVED BY 1 2

SERVING 2 4

LOCAL DIVERSIONS 2

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	1442.	1770.	4130.	1630.	1305.	1030.	550.	380.	376.	425.	605.	2440.	2885.
UNREG	2294.	2920.	6430.	2630.	2050.	1660.	890.	615.	610.	695.	970.	3880.	4520.
INFLOW	2194.	3165.	4130.	2285.	2002.	1674.	1922.	2266.	910.	691.	967.	3052.	3462.
REQ DIV	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
DIVERSN	970.9	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	684.2	962.5	1000.0	1000.0
SHORTGE	29.1	0.	0.	0.	0.	0.	0.	0.	0.	315.8	37.5	0.	0.
EOP STR		108528	282358	274926	248717	198914	148259	114673	106600	106600	106600	139663	207447
EOP EL		820.18	886.79	885.64	881.57	872.15	838.05	823.07	819.28	819.28	819.28	834.66	875.16
EVAPO	5697.	0.	0.	0.	1072.	884.	1081.	1171.	793.	404.	291.	0.	0.
REQ PWR	175200.	14880.	13440.	14880.	14400.	14880.	14400.	14880.	14880.	14400.	14880.	14400.	14880.
SYS 1	178092.	14880.	13864.	14880.	14400.	14880.	14400.	13604.	14390.	15679.	15212.	15424.	16480.
POWER	109465.	14880.	0.	14880.	14400.	14880.	14400.	13604.	198.	0.	0.	10662.	11561.
SHORTGE	65735.	0.	13440.	0.	0.	0.	0.	1276.	14682.	14400.	14880.	3738.	3319.
SYS SRT	68628.	0.	13864.	0.	0.	0.	0.	0.	14191.	15679.	15212.	4762.	4919.
CASE		202	403	202	202	202	202	202	202	202	202	403	403
LEVEL		2.63	6.09	4.88	3.81	3.10	2.50	2.10	1.00	1.00	1.00	6.06	6.26

CSV RFL	1080.	2134.	0.	1406.	1425.	1470.	1755.	1793.	28.	0.	0.	1496.	1359.
RIV FLW	1080.	2134.	0.	1406.	1425.	1470.	1755.	1793.	28.	0.	0.	1496.	1359.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

3 RESERVOIR C LEAKAGE 0. SERVED BY 3
SERVING 3 4

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	403.	100.	1360.	640.	100.	164.	82.	29.	27.	38.	165.	1080.	1130.
UNREG	403.	100.	1360.	640.	100.	164.	82.	29.	27.	38.	165.	1080.	1130.
INFLOW	403.	100.	1360.	640.	100.	164.	82.	29.	27.	38.	165.	1080.	1130.
EOP STR		10000	85530	84000	83517	34292	20000	20000	20000	20000	23906	56710	114164
EOP EL		728.00	810.42	809.37	809.01	764.97	744.10	744.10	744.10	744.10	750.39	788.27	827.96
EVAPO	1872.	0.	0.	0.	483.	336.	295.	315.	232.	120.	91.	0.	0.
CASE		301	403	303	301	401	401	301	301	301	301	403	403
LEVEL		1.00	6.41	6.00	4.97	2.59	2.00	2.00	2.00	2.00	5.71	6.41	6.91
CSV REL	165.	100.	0.	100.	100.	959.	317.	24.	23.	36.	100.	100.	100.
RIV FLW	256.	100.	0.	665.	100.	959.	317.	24.	23.	36.	100.	529.	196.
DES FLW	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
SHORTGE	26.	0.	100.	0.	0.	0.	0.	76.	77.	64.	0.	0.	0.

++

4 CONFLUENCE LEAKAGE 0. SERVED BY 1 2 3
LOCAL DIVERSIONS 4

YR 1926	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	1841.	1830.	8160.	1685.	1335.	1061.	575.	459.	402.	500.	702.	2725.	3195.
UNREG	4537.	4850.	15950.	4955.	3485.	2885.	1547.	1103.	1039.	1233.	1837.	7685.	8845.
INFLOW	3177.	4064.	8160.	3756.	2860.	3490.	2647.	2276.	453.	536.	802.	4750.	4750.
REQ DIV	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0
DIVERSN	-242.7	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-171.0	-240.6	-250.0	-250.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	3420.	4314.	8410.	4006.	3110.	3740.	2897.	2526.	703.	707.	1043.	5000.	5000.
DES FLW	2101.	100.	100.	100.	2000.	4500.	4500.	4500.	4500.	4500.	100.	100.	100.
SHORTGE	998.	0.	0.	0.	0.	760.	1603.	1974.	3797.	3793.	0.	0.	0.
MIN FLW	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

SYSTEM 1 POWER SUMMARY

SYSTEM TOTAL													
REQUIRD	300000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.
USABLE	219583.	31415.	0.	25000.	25000.	25000.	32400.	32204.	5838.	2623.	3692.	17282.	19129.
TOTAL	226950.	31415.	0.	25000.	25000.	25000.	34272.	37698.	5838.	2623.	3692.	17282.	19129.
SHORTGE	102712.	0.	25000.	0.	0.	0.	0.	1276.	19162.	22377.	21308.	7718.	5871.

ANNUAL INPUT DATA FOR 1927

**INFLOWS

STA 1	1600.	2600.	1610.	1275.	1680.	1570.	520.	345.	433.	500.	2050.	1185.
STA 2	4360.	7150.	4320.	3140.	3620.	3320.	1420.	715.	1075.	1660.	5720.	3280.
STA 3	1185.	1620.	1040.	576.	578.	497.	95.	35.	15.	320.	1410.	820.
STA 4	7330.	11210.	5540.	3820.	4615.	4130.	1658.	759.	1095.	2280.	7370.	6150.

ALL FLOWS IN CFS, STORAGES AND EVAP IN ACFT, AND POWER IN THOUSAND KWH

++

1 RESERVOIR A LEAKAGE 0. SERVED BY 1

SERVING 1 2 4

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	1269.	1600.	2600.	1610.	1275.	1680.	1570.	520.	345.	433.	500.	2050.	1185.
UNREG	1269.	1600.	2600.	1610.	1275.	1680.	1570.	520.	345.	433.	500.	2050.	1185.
INFLOW	1269.	1600.	2600.	1610.	1275.	1680.	1570.	520.	345.	433.	500.	2050.	1185.
EOP STR		319718	356000	356000	353255	356000	356000	338000	320766	295000	238000	342110	356000
EOP EL		1528.20	1543.29	1543.29	1542.27	1543.29	1543.29	1535.87	1528.64	1517.84	1493.46	1537.59	1543.29
EVAPO	5478.	0.	0.	0.	800.	716.	1029.	1282.	907.	450.	294.	0.	0.
REQ PWR	87600.	7440.	6720.	7440.	7200.	7440.	7200.	7440.	7440.	7200.	7440.	7200.	7440.
SYS 1	107526.	8333.	8333.	8333.	8516.	8689.	8902.	9931.	10120.	10600.	9100.	8333.	8333.
POWER	212084.	0.	29520.	27683.	21729.	27879.	25836.	13460.	10120.	13382.	21566.	4564.	14346.
SHORTGE	10076.	7440.	0.	0.	0.	0.	0.	0.	0.	0.	0.	2636.	0.
SYS SRT	12102.	8333.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3769.	0.
CASE		403	403	403	403	403	403	103	102	103	103	403	403
LEVEL		6.82	7.00	7.00	6.89	7.00	7.00	6.00	6.00	6.00	6.00	6.93	7.00
CSV REL	648.	0.	550.	485.	513.	707.	1113.	792.	611.	858.	1359.	300.	489.
RIV FLW	1076.	0.	1947.	1610.	1308.	1624.	1593.	792.	611.	858.	1422.	300.	959.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

2 RESERVOIR B LEAKAGE 0. SERVED BY 1 2

SERVING 2 4

LOCAL DIVERSIONS 2

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	2014.	2760.	4550.	2710.	1865.	1940.	1750.	900.	370.	642.	1160.	3670.	2095.
UNREG	3283.	4360.	7150.	4320.	3140.	3620.	3320.	1420.	715.	1075.	1660.	5720.	3280.
INFLOW	3090.	2760.	6497.	4320.	3173.	3564.	3303.	1692.	981.	1500.	2582.	3970.	3054.
REQ DIV	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
DIVERSN	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
EOP STR		315464	456000	456000	452199	456000	456000	420000	339946	287859	245000	372952	456000
EOP EL		893.23	929.00	929.00	928.03	929.00	929.00	919.82	899.42	887.65	880.99	907.83	929.00
EVAPO	9469.	0.	0.	0.	1408.	1260.	1811.	2247.	1535.	728.	480.	0.	0.
REQ PWR	175200.	14880.	13440.	14880.	14400.	14880.	14400.	14880.	14880.	14400.	14880.	14400.	14880.
SYS 1	192474.	16667.	16667.	16667.	16484.	16311.	16098.	15069.	14880.	14400.	15900.	16667.	16667.
POWER	244602.	0.	31976.	42792.	27546.	31918.	28343.	15685.	14880.	14400.	23781.	8618.	8663.
SHORTGE	26878.	14880.	0.	0.	0.	0.	0.	0.	0.	0.	0.	5782.	6217.
SYS SRT	32718.	14667.	0.	0.	0.	0.	0.	0.	0.	0.	0.	8049.	8003.
CASE		403	403	403	403	403	403	203	202	202	203	403	403
LEVEL		6.58	7.00	7.00	6.89	7.00	7.00	6.00	5.32	5.04	6.00	6.75	7.00

CSV REL	1211.	0.	1548.	1293.	1324.	1647.	1863.	1241.	1258.	1364.	1519.	820.	703.
RIV FLW	1734.	0.	2970.	3320.	2213.	2481.	2272.	1241.	1258.	1364.	2271.	820.	703.
DES FLW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

++

3 RESERVOIR C LEAKAGE 0. SERVED BY 3
SERVING 3 4

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	672.	1145.	1620.	1040.	576.	578.	497.	95.	35.	15.	320.	1410.	820.
UNREG	672.	1145.	1620.	1040.	576.	578.	497.	95.	35.	15.	320.	1410.	820.
INFLOW	672.	1145.	1620.	1040.	576.	578.	497.	95.	35.	15.	320.	1410.	820.
EOP STR		125000	125000	125000	124855	125000	125000	75258	36168	25726	25000	107714	125000
EOP EL		834.00	834.00	834.00	833.92	834.00	834.00	802.94	767.05	753.32	752.15	824.01	834.00
EVAPO	3512.	0.	0.	0.	616.	551.	791.	874.	428.	154.	98.	0.	0.
CASE		403	403	403	403	403	403	401	401	401	303	403	403
LEVEL		7.00	7.00	7.00	6.99	7.00	7.00	4.76	3.18	2.76	6.00	6.85	7.00
CSV REL	246.	100.	100.	100.	100.	246.	324.	890.	664.	188.	100.	20.	100.
RIV FLW	652.	969.	1620.	1040.	568.	567.	484.	890.	664.	188.	330.	20.	539.
DES FLW	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
SHORTGE	7.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	80.	0.

++

4 CONFLUENCE LEAKAGE 0. SERVED BY 1 2 3
LOCAL DIVERSIONS 4

YR 1927	AVG	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LOC FLW	2673.	4545.	6990.	2890.	1969.	2357.	2063.	1043.	379.	647.	1460.	3910.	4145.
UNREG	6630.	10090.	15760.	8250.	5685.	6555.	5880.	2558.	1129.	1737.	3440.	11040.	8245.
INFLOW	5060.	5554.	11580.	7250.	4750.	5405.	4819.	3174.	2300.	2198.	4062.	4750.	5387.
REQ DIV	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0
DIVERSN	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0	-250.0
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RIV FLW	5310.	5804.	11830.	7500.	5000.	5655.	5069.	3424.	2550.	2448.	4312.	5000.	5637.
DES FLW	2101.	100.	100.	100.	2000.	4500.	4500.	4500.	4500.	4500.	100.	100.	100.
SHORTGE	426.	0.	0.	0.	0.	0.	0.	1076.	1950.	2052.	0.	0.	0.
MIN FLW	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
SHORTGE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

SYSTEM 1 POWER SUMMARY

SYSTEM TOTAL													
REQUIRD	300000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.	25000.
USABLE	409482.	0.	48776.	55800.	45546.	50518.	46343.	29145.	25000.	27782.	42381.	13183.	25010.
TOTAL	460687.	0.	61496.	70475.	49275.	59797.	54179.	29145.	25000.	27782.	45346.	13183.	25010.
SHORTGE	43034.	25000.	0.	0.	0.	0.	0.	0.	0.	0.	0.	11817.	6217.

AVERAGES FOR PERIOD OF OPERATION 1926 - 1927

1 RESERVOIR A

LOC FLW	1061.
UNREG	1061.
INFLOW	1061.
EVAPO	4646.
REQ PWR	87600.
SYS 1	114717.
POWER	164785.
SHORTGE	13750.

```
CSV REL     702.
RIV FLW     916.
DES FLW       0.
SHORTGE       0.

 2    RESERVOIR B

LOC FLW    1728.
UNREG      2759.
INFLOW     2644.
REQ DIV  1000.0
DIVERSN   985.4
SHORTGE    14.6
EVAPO      7583.
REQ PWR  175200.
SYS    1 185283.
POWER    179033.
SHORTGE   46307.

CSV REL    1145.
RIV FLW    1407.
DES FLW       0.
SHORTGE       0.

 3    RESERVOIR C

LOC FLW     537.
UNREG       537.
INFLOW      537.
EVAPO      2692.

CSV REL     206.
RIV FLW     454.
DES FLW     100.
SHORTGE      16.

 4    CONFLUENCE

LOC FLW    2257.
UNREG      5583.
INFLOW     4118.
REQ DIV  -250.0
DIVERSN  -246.4
SHORTGE       0.
RIV FLW    4365.
DES FLW    2101.
SHORTGE     712.
MIN FLW     100.
SHORTGE       0.

DIVERSION SHORTAGE INDEX       2   .042      4 -1.000

POWER SHORTAGE INDEX           1  2.640      2  8.216
POWER SYSTEM 1  SHORTAGE INDEX  6.890 NO. OF SHORTAGES 10   MAX. SHORTAGE =    25000.

DES FLOW SHORTAGE INDEX        1 -1.000      2 -1.000      3  3.575      4 13.343

MIN FLOW SHORTAGE INDEX        1 -1.000      2 -1.000      3 -1.000      4  0.
```

STA	DIVRSION SHORTAGES NO	DIVRSION SHORTAGES MAX	DES FLOW SHORTAGES NO	DES FLOW SHORTAGES MAX	MIN FLOW SHORTAGES NO	MIN FLOW SHORTAGES MAX	SYS PWR SHORTAGES NO	SYS PWR SHORTAGES MAX	AT SITE PWR SHRTGS NO	AT SITE PWR SHRTGS MAX
1	-	-	0	0.	0	0.	8	11136.	7	7440.
2	2	316.	0	0.	0	0.	9	16667.	10	14880.
3	-	-	5	100.	0	0.	0	0.	0	0.
4	-	-	8	3797.	0	0.	0	0.	0	0.

STORAGE FREQUENCY PER 2 YEARS AT LOCATION 1

CONS POOL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
99-100 PCT	1	2	2	1	1	1	1	1	1	1	2	2
95- 99 PCT	0	0	0	0	0	0	0	0	0	0	0	0
90- 95 PCT	0	0	0	0	0	0	0	0	0	0	0	0
80- 90 PCT	0	0	0	1	0	0	0	0	0	0	0	0
70- 80 PCT	0	0	0	0	1	0	0	0	0	0	0	0
60- 70 PCT	1	0	0	0	0	0	0	0	0	0	0	0
40- 60 PCT	0	0	0	0	0	1	0	0	0	0	0	0
20- 40 PCT	0	0	0	0	0	0	0	0	0	0	0	0
1- 20 PCT	0	0	0	0	0	0	1	0	0	0	0	0
0- 1 PCT	0	0	0	0	0	0	0	1	1	1	0	0

STORAGE FREQUENCY PER 2 YEARS AT LOCATION 2

CONS POOL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
99-100 PCT	1	2	1	1	1	1	1	0	0	1	2	2
95- 99 PCT	0	0	0	0	0	0	0	0	0	0	0	0
90- 95 PCT	0	0	0	0	0	0	0	0	0	0	0	0
80- 90 PCT	0	0	0	0	0	0	0	1	0	0	0	0
70- 80 PCT	0	0	1	0	0	0	0	0	1	0	0	0
60- 70 PCT	0	0	0	0	0	0	0	0	0	0	0	0
40- 60 PCT	0	0	0	1	0	0	0	0	0	0	0	0
20- 40 PCT	0	0	0	0	1	0	0	0	0	0	0	0
1- 20 PCT	1	0	0	0	0	1	1	0	0	0	0	0
0- 1 PCT	0	0	0	0	0	0	0	1	1	1	0	0

STORAGE FREQUENCY PER 2 YEARS AT LOCATION 3

CONS POOL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
99-100 PCT	2	2	2	1	1	1	0	0	0	1	2	2
95- 99 PCT	0	0	0	0	0	0	0	0	0	0	0	0
90- 95 PCT	0	0	0	0	0	0	0	0	0	1	0	0
80- 90 PCT	0	0	0	0	0	0	0	0	0	0	0	0
70- 80 PCT	0	0	0	1	0	0	1	0	0	0	0	0
60- 70 PCT	0	0	0	0	0	0	0	0	0	0	0	0
40- 60 PCT	0	0	0	0	0	0	0	1	0	0	0	0
20- 40 PCT	0	0	0	0	1	0	0	0	2	0	0	0
1- 20 PCT	0	0	0	0	0	1	1	1	0	0	0	0
0- 1 PCT	0	0	0	0	0	0	0	0	0	0	0	0

```
CONTROL POINTS IDENTIFIED AS FOLLOWS
 1      RESERVOIR A
 2      RESERVOIR B
 3      RESERVOIR C
 4      CONFLUENCE

BENEFIT FUNCTIONS IDENTIFIED AS FOLLOWS
 1         QUALITY CONTROL
 2         FISH
 3         RECREATION
 4         POWER
 5         WATER SUPPLY
 6
 7
 8

FUNCTIONS FOR BENEFIT 1
       4      12      0.    2000.    2000.      0.      0.      0.      0.      0.
       4      12    -50.      50.      50.      0.      0.      0.      0.      0.

FUNCTIONS FOR BENEFIT 2
       3      12      0.     100.     100.      0.      0.      0.      0.      0.
       3      12    -20.      20.      20.      0.      0.      0.      0.      0.
       4      12      0.     100.     100.      0.      0.      0.      0.      0.
       4      12    -40.      40.      40.      0.      0.      0.      0.      0.

FUNCTIONS FOR BENEFIT 3
       1       4      0.  356000.      0.      0.      0.      0.      0.      0.
       1       4      0.       0.      0.      0.      0.      0.      0.      0.
       1       9      0.  150000.  356000.     0.      0.      0.      0.      0.
       1       9      0.       0.     50.      0.      0.      0.      0.      0.
       1      12      0.  356000.      0.      0.      0.      0.      0.      0.
       1      12      0.       0.      0.      0.      0.      0.      0.      0.
       2       4      0.  456000.      0.      0.      0.      0.      0.      0.
       2       4      0.       0.      0.      0.      0.      0.      0.      0.
       2       9      0.  200000.  456000.     0.      0.      0.      0.      0.
       2       9      0.       0.     70.      0.      0.      0.      0.      0.
       2      12      0.  456000.      0.      0.      0.      0.      0.      0.
       2      12      0.       0.      0.      0.      0.      0.      0.      0.
       3       4      0.  125000.      0.      0.      0.      0.      0.      0.
       3       4      0.       0.      0.      0.      0.      0.      0.      0.
       3       9      0.   50000.  125000.     0.      0.      0.      0.      0.
       3       9      0.       0.     30.      0.      0.      0.      0.      0.
       3      12      0.  125000.      0.      0.      0.      0.      0.      0.
       3      12      0.       0.      0.      0.      0.      0.      0.      0.

FUNCTIONS FOR BENEFIT 4
       1      12      0.    4000.   25000.      0.      0.      0.      0.      0.
       1      12   -200.      12.      24.      0.      0.      0.      0.      0.
       2      12      0.   16000.  100000.      0.      0.      0.      0.      0.
       2      12   -800.      48.      96.      0.      0.      0.      0.      0.
```

FUNCTIONS FOR BENEFIT 5

2	3	0.	9.	0.	0.	0.	0.	0.	0.
2	3	0.	0.	0.	0.	0.	0.	0.	0.
2	4	0.	8.	16.	0.	0.	0.	0.	0.
2	4	-20.	0.	4.	0.	0.	0.	0.	0.
2	5	0.	75.	149.	0.	0.	0.	0.	0.
2	5	-140.	0.	35.	0.	0.	0.	0.	0.
2	6	0.	160.	317.	0.	0.	0.	0.	0.
2	6	-320.	0.	80.	0.	0.	0.	0.	0.
2	7	0.	250.	508.	0.	0.	0.	0.	0.
2	7	-480.	0.	120.	0.	0.	0.	0.	0.
2	8	0.	200.	397.	0.	0.	0.	0.	0.
2	8	-400.	0.	100.	0.	0.	0.	0.	0.
2	9	0.	70.	134.	0.	0.	0.	0.	0.
2	9	-160.	0.	40.	0.	0.	0.	0.	0.
2	12	0.	9.	0.	0.	0.	0.	0.	0.
2	12	0.	0.	0.	0.	0.	0.	0.	0.

FUNCTIONS FOR BENEFIT 6
NONE

FUNCTIONS FOR BENEFIT 7
NONE

FUNCTIONS FOR BENEFIT 8
NONE

AVERAGE ANNUAL BENEFITS IN THOUSAND DOLLARS

PROJECT BENEFITS AT CONTROL POINTS

STA	SUM	FUNCTION 1	2	3	4	5
1	95.	0.	0.	138.	-43.	0.
2	250.	0.	0.	131.	-2480.	2599.
3	31.	0.	-4.	35.	0.	0.
4	21.	21.	0.	0.	0.	0.
SM	397.	21.	-4.	304.	-2523.	2599.

PROJECT BENEFITS ALLOCATED TO RESERVOIRS

STA	SUM	FUNCTION 1	2	3	4	5
1	100.	5.	0.	138.	-43.	0.
2	235.	-15.	0.	131.	-2480.	2599.
3	22.	-9.	-4.	35.	0.	0.
4	40.	40.	0.	0.	0.	0.
SM	397.	21.	-4.	304.	-2523.	2599.

PROJECT PLUS PREPROJECT BENEFITS AT CONTROL POINTS

STA	SUM	FUNCTION 1	2	3	4	5
1	95.	0.	0.	138.	-43.	0.
2	250.	0.	0.	131.	-2480.	2599.
3	196.	0.	161.	35.	0.	0.
4	991.	511.	480.	0.	0.	0.
SM	1532.	511.	641.	304.	-2523.	2599.

TOTAL POTENTIAL BENEFITS AT CONTROL POINTS

STA	SUM	FUNCTION 1	2	3	4	5
1	538.	0.	0.	250.	288.	0.
2	1881.	0.	0.	350.	1152.	379.
3	390.	0.	240.	150.	0.	0.
4	1080.	600.	480.	0.	0.	0.
SM	3889.	600.	720.	750.	1440.	379.

REMAINING POTENTIAL BENEFITS AT CONTROL POINTS

STA	SUM	FUNCTION 1	2	3	4	5
1	443.	0.	0.	112.	331.	0.
2	1631.	0.	0.	219.	3632.	-2220.
3	194.	0.	79.	115.	0.	0.
4	89.	89.	0.	0.	0.	0.
SM	2357.	89.	79.	446.	3963.	-2220.

EXHIBIT 3

OUTPUT DATA DESCRIPTION

HEC-3

RESERVOIR SYSTEM ANALYSIS FOR CONSERVATION

The program has the capability of printing a monthly and annual output, summary data, and rearranged data. The summary and rearranged data are optional and must be requested by the user on the J3 and J4 cards. The standard output includes a labeled printout of input data, monthly reservoir and control point operational data arranged by year, system power summary, average values of simulation data, and shortage and frequency data. A detailed description of the standard output is presented below.

a. Printout of Input Data

Test Data 2 of exhibit 2 illustrates the standard output provided by the program. Input data specified on the job cards (J1-J9) are printed out and titled first. This is followed by a printout of input data for each control point - arranged in an upstream to downstream sequence.

b. Monthly Reservoir Operation Data Arranged by Year

The purpose of the program is to simulate the operation of a reservoir system on a month to month basis. Beginning with the first year it prints out the simulation results for each month and each control point. This is repeated successively for all years of the simulation. The data printed out is defined below.

(1) Annual Input Data

ANNUAL INPUT DATA FOR 1926
**INFLOWS

Input inflow values in cfs or cubic meters per second are tabulated by control point and period for the particular year.

(2) Control Point Identification

3 RESERVOIR B LEAKAGE 0 SERVED BY 1 3

SERVING 3 5 6 7

LOCAL DIVERSIONS 3

This information identifies the control point as 3 and Reservoir B. There is zero leakage specified from the reservoir and the reservoir is served by reservoir 1 and itself and serves downstream control points 3 5 6 7.

(3) Flow Data

YR 1926 AVG JAN ··· - Column headings. All output flow data contain yearly average values followed by values for each month in cubic meters per second, or user specified units. The quantities under AVG for evaporation and power are annual sums.

LOC FLOW - Average local inflow to the control point. Computed according to the rule specified on the LF card.

UNREG - Total unregulated (natural) inflow to the control point. Equals the summation of all local flows above the control point, including those above reservoirs. (i.e., 1150 + 1770 = 2920)

INFLOW - Regulated inflow to the control point. Equals the flow released from upstream reservoirs plus the cumulative local inflow between control point and upstream reservoirs. (i.e., 1395 + 1770 = 3165)

REQ DIV - Magnitude of the flow required to be diverted at the control point as specified on the ID or DV cards.

DIVERSN - Magnitude of the flow actually diverted.

SHORTGE - Difference between REQ DIV and DIVERSN.

(4) Reservoir Data

EOP STR - End of period storage in the reservoir as computed during the simulation (ac-ft or 1000 cubic meters).

EOP EL - End of period reservoir elevation corresponding to end of period storage EOP STR (ft or meters).

EVAPO - Evaporation occurring during the period (ac-ft or 1000 cubic meters).

REQ PWR - at-site energy requirements (1000 Kwh) as specified on the PR card.

SYS 1 - Energy requirement (1000 Kwh) for power system 1 that is allocated to this project. This value changes by month and year depending upon the project capability and the input system energy requirement (J9 card).

POWER - Energy (1000 Kwh) generated at the project.

SHORTGE - The shortage of energy requirements as computed by the difference between REQ PWR and POWER.

SYS SRT - Difference between SYS 1 and POWER. Represents the system power shortage allocated to this project.

CASE - The first digit (or first two if a four digit number) indicates the control point number which is controlling the operation. The last digits specify the condition which is controlling- 1 = minimum flow requirement, 2 = power requirement, 3 = flood control release. For example, CASE = 2101 indicates at control point 21, minimum flow requirements control.

LEVEL - Indicates the end of period reservoir storage level. For example, 2.63 indicates that 63 percent of the storage space between levels 2 and 3 is occupied.

(5) Flow Release Data

CSV REL - Magnitude of the flow at the control point which is released to meet conservation requirements downstream. The regulated flow (RIV FLOW) may be greater than this value because of spillage.

RIV FLOW - Magnitude of the regulated river flow occurring at the control point.

DES FLOW - Minimum desired flow at the control point as specified on the QD or ID cards. Desired flow will be released if reservoir is above the top of buffer pool.

MIN FLOW - Minimum required flow at the control point as specified on the QR or ID cards. The minimum required flow will be released if the reservoir is below the top of buffer.

SHORTGE - Magnitude by which desired or required flow is not met, i.e., short. Difference between DES FLOW and RIV FLW, or MIN FLOW and RIV FLOW.

c. System Power Summary

REQUIRD - The system energy requirement (1000 Kwh) as specified on the J9 card.

USABLE - Total energy generated (1000 Kwh) based upon plant factor for the system (PFMAX on P1 card) at all projects in the power system. Secondary or dump energy is the difference between TOT. and USABLE energy.

TOTAL - The total energy generated at the powerplants in the system based on individual overload ratios (OVLOD on P1 card). Equals the summation of POWER for each powerplant. (1000 Kwh)

SHORTGE - The system energy shortage computed as the difference between REQUIRD and USABLE energy but not less than 0.

d. Average Values of Data for Simulation Period

The variables printed out in the tabulation correspond to the variables with the same name described in the previous section. The values shown are the average value of the variables for the entire period of operation.

e. Shortage and Frequency Data

Following the printout of average values several shortage indices are tabulated, as required:

DIVERSION SHORTAGE INDEX

POWER SHORTAGE INDEX

POWER SYSTEM 1 SHORTAGE INDEX

DES FLOW SHORTAGE INDEX

MIN FLOW SHORTAGE INDEX

Each index is computed by summing the squares of the annual shortage and multiplying by 100/number of years of operation. The annual shortage is expressed as the ratio of the annual shortage divided by the annual requirement.

$$\text{SHORTAGE INDEX} = \frac{100}{N} \sum_{1}^{N} \left(\frac{\text{ANNUAL SHORTAGE}}{\text{ANNUAL REQUIREMENT}} \right)^2$$

As an example, consider the computation of the diversion shortage index. The following data is computed as part of the simulation data:

	1926	1927
Annual diversion shortage	64	0
Annual diversion requirement	1000	1000
Annual shortage as a ratio	.064	0
Number of years of operation	2	

$$\text{Diversion shortage index} = \frac{100}{2} [(.064)^2 + (0)^2] = .205$$

The shortage index for the other variables are computed in a similar manner. Basically, the index is a measure of the frequency and magnitude of shortage. An index of 1.0 could occur with 100 ten percent annual shortages in a 100-year period means an average annual shortage of 10 percent. An index of 1.0 could occur with 25 percent annual shortages in a 100-year period. A shortage index of zero indicates no major shortages and a 1.000 indicates no requirement for that demand.

The computer program outputs another type of shortage summary which for each control point and type of shortage, shows the number of shortages, and maximum value of the shortage. In the example below control point 3 experienced 3 monthly shortages, one with a magnitude of 410.

SHORTAGES

STA	NO	MAX
1	-	-
2	-	-
3	3	410
⋮	⋮	⋮

Storage-frequency data for the period of operation is computed and printed out for each reservoir control point. As shown below the values are shown for various ranges within the conservation pool and frequency is shown by counting the number of Januarys or Februarys when the reservoir was within that range of the conservation pool. Thus, during the period of operation at the end of one January the reservoir storage was between 99-100 percent of full conservation storage only once for January. Likewise for February, the storage was between 99-100 percent of full conservation only twice. The conservation pool is that volume between top of inactive pool (level 1) and the bottom of flood control pool.

CONS POOL	JAN	FEB	--
99-100 PCT	1	2	
95-99 PCT	0	0	

EXHIBIT 4

INPUT DESCRIPTION

HEC-3

RESERVOIR SYSTEM ANALYSIS FOR CONSERVATION

This exhibit contains a detailed description of each variable on each input card. Many of the cards shown can be omitted if certain options are not required. The summary of input cards at the end of this exhibit shows the sequential arrangement of cards.

Variable locations for each input card are shown by field number. The cards are normally divided into ten fields of eight columns each except field 1. Variables occurring in field 1 may normally only occupy card columns 3-8 since card columns 1 and 2 (except for J6 card) are reserved for the required identification characters. The different values a variable may assume and the conditions for each are described for each variable. Some variables simply indicate whether a program option is to be used or not by using the numbers -1, 0, 1. Other variables contain numbers which express the variable magnitude. For these a + sign is shown in the description under "value" and the numerical value of the variable is entered as input. Where the variable value is to be zero the variable may be left blank since a blank field is read as zero.

If decimal points are not punched in the data, all numbers must be right justified in the field. Any number without a sign is considered positive.

A. Title Cards

** T1, T2, T3 Cards

Job title cards. Three cards required. Both alphabetic and numeric information may be placed on these cards. Information on these cards will be printed out as job title on the first page of the output.

**Required cards

B. Job Cards

** J1 Card - First Job Card

Job card which specifies program options and operation priorities.

Field	Variable	Value	Description
1	NYRS	+	Number of years in routing.
2	IYR	+	Number of first year in routing (1935, for example).
3	NL	+	Number of target storage levels at each reservoir. At least four levels are required. Maximum number of levels (limited by dimension) is eight. Levels are described on the RL card.
4	ICONS	0	If ICONS is zero or blank, downstream conservation releases will be restricted to channel capacity to simulate flood control considerations in conservation studies. This is the normal option for conservation studies.
		+	If ICONS is positive, conservation releases are not restricted by downstream channel capacities.
5	IDVSP	0	If IDVSP is zero or blank, uncontrolled spill will be released to the river below a reservoir. This is the normal option.
		+	If IDVSP is positive, uncontrolled spills will be added to diversion if one exists at the reservoir. See Appendix II.
6	IPWPR	0	If IPWPR is zero or blank, power shortages will not be declared within the buffer zone (between levels 1 and 2). This permits power production to share the highest priority throughout the full conservation pool.
		-1	If IPWPR is -1, power shortages are declared when the reservoir storage is within the buffer zone. This gives power a lower priority than other purposes served by water from the buffer storage.

**Required cards

J1 Card (continued)

Field	Variable	Value	Description
7	IDVPR	0	If IDVPR is zero or blank, diversion shortages for diversions from a reservoir will not be declared within the buffer zone. This permits diversions to share the highest priority throughout the full conservation pool.
		-1	If IDVPR is -1, diversion shortages are declared when the reservoir storage is within the buffer zone. This gives diversions a lower priority than other purposes served by water from the buffer storage.
8	IFLOW	0	Maximum yield will not be computed for any control point. This is the normal option for most studies.
		+	Control point number for location where maximum yield is to be computed by iteration process. Maximum yield can be computed for only one control point location per run. See Appendix I.
9	JUPQI	0	Local inflows, read from IN cards and computed by ratios on the LF card, are cumulative flows and are for areas upstream of the control point and downstream of the nearest upstream reservoirs.
		+	Calls for specifying local flows (IN and LF cards) as incremental inflows between adjacent control points.

* J2 Card - Constants and Input and Output Units

Job card specifying units of input data and output data, conversion constants, and contingency ratios. If omitted default values in parentheses will be assigned.

Field	Variable	Value	Description
1	CLOCL (1.0)	0	Contingency factor of 1.0 is assumed.
		+	Contingency factor for adjusting local flows below reservoirs to account for forecast uncertainty or other contingencies in conservation operation. Must be between 0.0 and 1.0. (For example, a value of .85 for CLOCL will cause all local flows below reservoirs to be temporarily multiplied by .85 to account for a 15 percent contingency in conservation forecasts of local flow.)
2	CFLOD (1.0)	0	Contingency factor of 1.0 is assumed.
		+	Contingency factor for adjusting local flows below reservoirs to account for forecast uncertainties or contingencies that affect flood control operation. Must be equal to or greater than 1.0. (For example, a value of 1.15 for CFLOD will cause all local flows below reservoirs to be temporarily multiplied by 1.15 to account for a 15 percent contingency in flood control forecasts of local flows.)
3	IUNIT (0)	0	If IUNIT is zero or blank, output data will be in standard flow units of cfs (m^3/sec for metric system) and volume units of acre-feet (thousand cubic meters for metric system). Fields 7-10 will also be zero.
		+1	Allows for nonstandard output units as specified in fields 7, 8, 9 and 10 of this card. Data for all four fields must be specified.

*Optional card

J2 Card (continued)

Field	Variable	Value	Description
4	METRC (0)	0	If METRC is zero or blank, input and output will be in English units (cfs and acre-feet).
		+1	Input and output data in metric units (m^3/sec and thousand cubic meters).
5	CNSTI (1.0)	0	Inflow rates are in cfs or m^3/sec. (Ratio CNSTI is assumed 1.)
		+	Ratio to convert input inflow rates (card IN) from nonstandard to standard units (i.e., CNSTI is 1.0 if input inflow data is in cfs or cms and 100.0 if input inflow data is in hundred cfs or hundred m^3/sec).
		-	Ratio (preceded by a minus sign) to convert input inflow volumes (card IN) from nonstandard to standard units (i.e., CNSTI is -1.0 if input inflow data are in acre-feet or thousand cubic meters, and -1000 if input inflow data are in thousand acre-feet or million cubic meters).
6	CNSTO (1.0)	0	Input flow rate requirements are in cfs or m^3/sec. (CNSTO is assumed 1.)
		+	Ratio to convert input flow rate requirements (cards ID, DV, QD, OR and QM) from nonstandard to standard units. (See description for CNSTI, above.)
		-	Ratio to convert input flow volume requirements (cards ID, DV, QD, QR and QM) from nonstandard to standard units. (See description for CNSTI, above.)

J2 Card (continued)

Field	Variable	Value	Description
7	CCFS (1.0)	0	Must be zero or blank if IUNIT (field 3) is zero or blank.
		+	Ratio to convert output flow data from standard rate (cfs or m^3/sec) units to nonstandard rate units.
		-	Ratio to convert output flow data from standard rate units (cfs) to volume units (acre-feet). CCFS is -1.0 for output in acre-feet and -.001 for thousands of acre-feet.
8	QUNIT (cfs)	Alpha	Four-character alphabetic symbol for output headings when using nonstandard flow units. Must be right-justified. (For example, KCFS might be used if output units are to be in thousands cfs.)
9	CACFT (1.0)	0	Must be zero or blank if IUNIT (field 3) is zero or blank.
		+	Ratio to convert output volume data from standard (acre-feet or thousand cubic meters) units to nonstandard units.
10	VUNIT	Alpha	Four-character alphabetic symbol for output headings when using nonstandard volume units. Must be right-justified.

* J3 Card - Output Options

Job card which permits user to select various output options and some program options. If omitted, default values in parentheses will be assigned.

Field	Variable	Value	Description
1	IPRNT (0)	0	If IPRNT is zero or blank, the standard monthly and annual output is obtained.
		-1	If IPRNT is -1, the standard monthly and annual output is suppressed. Only summary data and rearranged data (if selected) is printed out.
2	IPRL (0)	0	If IPRL is zero or blank, reservoir target levels are printed out only once at the beginning of the output. This is all that is normally required.
		+	If IPRL is positive, reservoir target levels are printed out for each reservoir each year to facilitate checking of results. This causes a substantial increase in the volume of output and should only be used for short runs with small systems.
3	IPWKW (0)	0	If IPWKW is zero or blank, power generation output data will be in thousand kwh.
		+	If IPWKW is positive, power generation output data will be in kilowatts.
4	IUPDT (0)	0	If IUPDT is zero or blank, the system data will not be updated to reflect changes in the system configuration. This is the normal option.
		+	If IUPDT is positive, the system data will be updated at the end of NYRS (J1 card, field 1). To use this option the user must supply a complete new set of input data, beginning with the T1 cards, immediately following the last data card for the first NYRS of data while reservoir status is maintained.

*Optional card

J3 Card (continued)

Field	Variable	Value	Description
5	IDGST (0)	0	If IDGST is zero or blank, no diagnostic or intermediate printout is obtained. This is the normal option.
		+	If IDGST is positive, intermediate diagnostic printout is obtained in addition to the normal output. This option should only be used when attempting to diagnose the cause for errors or inconsistencies in study results.
6-10			Not used.

* J4 Card - Output Rearrangement

Job card which specifies which output data are to be rearranged and printed after the normal year by year output. Indicated output data will not be rearranged if zero or blank is specified in the appropriate field. Rearranges first 50 years only. (Restricted by dimension.) If this card is omitted, output data will not be rearranged. For the first nine fields, if the specified value is:

1 - Output data will be rearranged by control points (i.e., all output values for the item will be summarized for all years at each control point);

2 - Output data will be rearranged by years (i.e., all output values for the item will be summarized for all control points in each year);

3 - Output data for the item will be summarized both by control point and by year.

In the tenth field, if the specified value is:

1 - Reservoir data will be rearranged for all reservoirs and all years;

2 - Reservoir data will be rearranged only for those reservoirs with power plants.

Field	Variable	Value	Description
1	IRG(1)	See above.	Rearranges unregulated flows.
2	IRG(2)	"	Rearranges river flows.
3	IRG(3)	"	Rearranges diversions.
4	IRG(4)	"	Rearranges diversion shortages.
5	IRG(5)	"	Rearranges desired flow shortages.
6	IRG(6)	"	Rearranges required minimum flow shortages.
7	IRG(7)	"	Rearranges end-of-period storages.
8	IRG(8)	"	Rearranges change of storage at end-of-period.
9	IRG(9)	"	Rearranges end-of-period elevation.
10	IRG(10)	"	Rearranges reservoir data (storage, elevation, inflow, outflow, evaporation and power generation).

*Optional card

* J5 Card - Routing Time Interval

Job card which specifies the time intervals to be used in the routing. If omitted, default values in parentheses will be assigned.

Field	Variable	Value	Description
1	NPER (12)	+	Number of routing periods per year. Normal number is 12 for conservation studies. Periods do not have to be of equal length in conservation studies and do not necessarily coincide with calendar months. Output format is designed for 14 or less periods per year.
2	IPERA (1)	+	The identification number of the first routing period in each year (i.e., IPERA is 1 if routing is done and data supplied on a calendar-year basis; IPERA is 10 if routing is done and data supplied on a water-year basis).

* J6 Card - Period Names (No identification in columns 1 and 2)

Job cards which identify the name of each period. Each period name may be up to eight characters in length. Both alphabetic and numeric characters are permitted. Period names should be centered within the eight-column fields to improve appearance of output. Not required if periods are based on calendar months (default values).

Field	Variable	Value	Description
1	APERD(1) (JAN)	Alpha	Period name for first period (example: JAN).
2	APERD(2) (FEB)	Alpha	Period name for second period (example: FEB).

Continue supplying period names until a name has been supplied for each of the NPER periods (normally 2 cards). The name in the first field must be the name corresponding to period number IPERA (J5 card, field 2).

*Optional card

* J7 Card - Length of Periods (Supply or omit both J6 and J7 cards.)

Job cards which specify the number of days in each period. Not required if periods are based on calendar months (default values are number of days in calendar month).

Field	Variable	Value	Description
1	NDAYS(1) (31)	+	Number of days in first period.
2	NDAYS(2) (28)	+	Number of days in second period.

Continue supplying number of days in each period until NPER values have been supplied (normally 2 cards). The number of days in the first field must be the number of days in period number IPERA (J5 card, field 2).

* J8 Card - System Evaporation

This card specifies index evaporation rate for the entire system for each period. If NPER (J5 card, field 1) is greater than 10, two cards must be used to describe the evaporation. If omitted, card YE or EV must be given.

Field	Variable	Value	Description
1-12	EVAPO	$\pm$	Net index evaporation rate in inches (or mm if METRC is positive). Specify NPER (J5 card, field 1) values in successive order, one value per field. The first value must be the value for period number IPERA (J5 card, field 2). Usually computed as the difference between evaporation and rainfall. Must be supplied as positive when evaporation exceeds rainfall and negative when rainfall exceeds evaporation.

*Optional card

* J9 Card - System Power

These cards specify system energy requirements for each power system for each period. Omit if there is no system power operation. One set of J9 cards is required for each power system (maximum of two systems). If NPER (J5 card, field 1) is greater than 10, two cards must be used to describe each power system.

Field	Variable	Value	Description
1-10	PWRS	+	System energy requirements in thousand of kwh. Specify NPER (J5 card, field 1) values in successive order, one value per field. The first value must be the value for period number IPERA (J5 card, field 2). The second power system is started in the first field of a new J9 card. Two cards are normally required for each power system.

System Specification Cards

System specification cards are used to specify the configuration of the water resource system and the constraints and objectives for operation of each component of the system. The term "control point" is used to describe any location within a system where information is needed. A set of system specification cards is required for each control point. Each set of system specification cards is composed of three subsets. The first subset (cards CP-GM) is required for all control points. The second subset (cards R1-RE) is only required when there is a reservoir located at the control point. The third subset (cards P1-PE) is only required when there is a power installation at the control point. The sets of system specification cards must be arranged in downstream order beginning with the most upstream control point and proceeding until a confluence is reached. At each confluence, all control points above that confluence must be entered before proceeding to control points below the confluence.

*Optional card

C. Control Point Subset (Cards CP-OM)

** CP Card - Control Point Specification

The CP card specifies the control point number, the relationship of the control point to the next downstream control point, and the physical components that exist at the control point. It is required for each control point.

Field	Variable	Value	Description
1	M	+	Control point number. Must be an integer between 1 and 40 (limited by dimension) or between 1 & 30 if a reservoir. Control point numbers do not have to be in numerical order.
2	MDNST	+	Control point number of the next downstream control point.
		-1	Use -1 when M is the most downstream control point.
3	IPRM	0	Zero or blank indicates that standard output printout is desired for this control point.
		-1	Value of -1 indicates that standard output printout for this control point should be suppressed. If -1 is specified, only summary data will be printed for this control point.
4-10			Not used.

**Required card

** ID Card - Control Point Identification

The ID card is required for each control point. It specifies diversion and minimum flow requirements, maximum flow capability, and the control point name.

Field	Variable	Value	Description
1	QDV[1]	+	Diversion requirements at this control point. This value will be used for all routing periods. Requirements that vary from period to period are specified on the DV card.
2	QMN[1]	+	Minimum desired flow at this control point. This is the flow requirement which will be met at all times when the storage level in upstream reservoirs exceeds the top of the buffer zone (see RL card). The purpose of this constraint is to permit a flow requirement somewhat higher than the absolute minimum to be used when reservoir storage levels are not critically low. If QMN is specified as a positive value in this field, that positive value will be used for all routing periods. Minimum desired flows that vary from period to period within a year are specified on the QD card.
3	QM2[1]	+	Minimum required flow at this control point. Reservoir releases will be made to maintain this flow requirement as long as there is any useable storage (between levels 1 and 2) in upstream reservoirs. Minimum required flows at this control point that vary from period to period within a year are specified on the QR card.

[1]Standard units (cfs or m^3/sec) unless nonstandard units have been specified by CMSTD (J2.6).
**Required card

ID Card (continued)

Field	Variable	Value	Description
4	QMXX[1]	+	Maximum permissible flow at this control point. Usually the nondamaging channel capacity is specified. Reservoir releases that would cause streamflow at this point to exceed this value will not be permitted until reservoir storage exceeds the top of the flood control pool (the highest level from field 3 of J1 card). If maximum permissible flows at this control point vary from period to period, they are specified on the QM card.
5-8	CPT	Alpha	Control point identification or name. Both alphabetic and numeric characters can be used. It is not necessary to include the control point number in the station identification. Limit is 32 characters including blanks.
9-10			Not used.

[1]Standard units (cfs or m^3/sec) unless nonstandard units have been specified by CNSTO (J2.6).

* LF Card - Local Flow Specification

This card specifies the identification number of the flow data (IN cards) used to compute either cumulative (JUPQI = 0, on J1 card) or incremental (JUPQI = 1) local flows for this control point and the ratios used in the computation. If NFLW is greater than 4, two or more cards will be required. Omit if there is no computation required to obtain local flow. This can occur if: (1) IN cards are provided for this control point that represent flows between this control point and control points immediately upstream (JUPQI = 1); or (2) IN cards are provided for this control point that represent flows between this control point and all reservoirs immediately upstream (JUPQI = 0). Omission of this card requires the flow data (IN card) to have the same identification as this control point (CP card, field 1)

Field	Variable	Value	Description
1	NFLW	+	Number of flow locations involved in computing local flow, either cumulative or incremental (based on JUPQI), for this control point. This will be positive if: (1) no flows are provided as input on IN cards for this control point and cumulative or incremental local flow is to be calculated by a ratio (such as drainage area ratio) times some single input flow data location (NFLW = 1) or some combination of multiple input flow data locations (NFLW > 1); or (2) if flows provided as input on IN cards for this control point, are total flows at this control point rather than incremental or cumulative local flows. The summation of all NFLW for all control points must not exceed 90 (dimension limit).
2	NQ	+	Identification number of first flow station involved in computing local flows for this control point (must equal an M on IN cards). Identification numbers for flow stations do not have to correspond to control point numbers, but they must be integers and less than 40. See description for variable M (IN card, field 1).

*Optional card

*LF Card (continued)

Field	Variable	Value	Description
3	RTIO	±	Ratio by which flow data for station MQ in preceding field is to be multiplied to obtain local flow at this control point. Negative value indicates flow at station MQ should be multiplied by RTIO and then subtracted from other flows involved in the computation.
4-9			Repeat values of MQ and RTIO until NFLW pairs have been specified. For example, to calculate cumulative or incremental local flows between a control point and two immediately upstream reservoirs where the input flow for the control point is the total flow and where the flow identification number for the control point is 7, and the flow identification numbers for the two upstream reservoirs are 2 and 5, the input values would be 7, 1.0; 2, -1.0; 5, -1 in fields 2-7, respectively.
10	MQ(5)	+	Every fifth pair of MQ and RTIO will be split between the tenth field of one card and first field of the next card.

* EC Card - Hydrologic Parameters Used in Economic Evaluation

This card identifies the hydrologic parameters at this control point that will be used in economic evaluation. If omitted, economic evaluation will not be made at this control point.

Field	Variable	Value	Description
1-8	IE	0	No economic function for this control point.
		1	Economic evaluation based on river flow and unregulated flow in cfs (or m^3/sec) at the control point.
		2	Economic evaluation based on reservoir storage in acre-feet (or 1000 m^3) at this control point.
		3	Economic evaluation based on energy generation in kwh at this control point.
		4	Economic evaluation based on diversion flow in cfs (or m^3/sec) at this control point.

As many as eight benefit functions may be used in the economic evaluation. Each of the eight fields on the EC card represents one benefit function. For example, in an economic evaluation of power production on the basis of energy generation, and recreation on the basis of reservoir storage and where energy generation is selected as benefit function 1 and recreation as benefit function 2, the value specified in field 1 for each control point with a power plant to be evaluated would be 3 and the value specified in field 2 for each control point with a recreation benefit would be 2. The order chosen (power first and recreation second) must be maintained for all control points and must be followed on the BM, BP and BV cards. Zero or blanks must be specified for all fields not being used for a particular control point.

Field	Description
9-10	Not used.

*Optional card

* SV Card - Locations not Served by Reservoir

This card specifies the number and identity (control point number) of the downstream locations not served by a reservoir at this control point. If NTSRV on this card is greater than 9, two cards will be required.

Field	Variable	Value	Description
1	NTSRV	+	Number of downstream control points that should not be served by water stored in reservoir at this location. This enables user to specify whether or not water may be withdrawn from this reservoir to meet downstream demands at any point.
2-10	ITSRV	+	Identification numbers of downstream control points where water requirements will not be served by storage in reservoir at this control point number (from last card CP, field 1). Provide NTSRV values, one value per field.

* DV Card - Varying Diversion Requirements

This card specifies diversion requirements at this control point that vary from period to period and normally requires two cards. Return flows can be specified by entering the control point number of the upstream diversion in field 1 and a negative value for the return flow ratio in field 2. For example, a value of 26 in field 1 and a value of -.35 in field 2 would indicate a return flow at this control point which is 35 percent of the flow diverted at control point 26. Return flows can only be calculated as a function of diversions at one upstream control point. Either QDV (ID.1) or DV card(s) must be provided even if YD cards supplied. Dimensioned for 25 diversions.

Field	Variable	Value	Description
1	QDIV	+	Diversion requirements for first period in standard flow units (cfs or m^3/sec) unless nonstandard flow units have been specified by CNSTO (J2 card, field 6). If field 2 is negative, this is the control point number as described above.
2	QDIV	+	If positive, diversion requirements for second period; NPER (J5 card, field 1) values must be provided.
		-	If negative, ratio to compute return flow as described above.

*Optional card

DS
DF
DP

* DS Card - Diversion Specifications

Field	Variable	Value	Description
1	IDIVF(M)		Specifies parameter to base diversion on.
		1	Diversion based on natural flow.
		2	Diversion based on regulated flow.
		3	Diversion based on reservoir storage.
2	NDIV(M)	+	Number of values to follow on each DF and DP cards.
3	IDCPT(M)	+	Control point number where parameter is to compute diversion. Used where diversion is a function of storage or flow at some other location. May be left blank if at this control point.
4	IDSHT(M)	0	Diversion shortages will be computed.
		1	Diversion shortages set to zero at this control point.

* DF Card - Diversion Rate

Field	Variable	Value	Description
1	DFUNCT(1,M)	+	Diversion rate to be made at corresponding status of selected parameter on DP card. Diversion will be less than or equal to diversion specified by QDV (ID card, field 1) or by DV cards.
2	DFUNC(2,M)	+	Second diversion rate.

Provide NDIVF(DS-2) values, dimensioned for 20 values.

* DP Card - Parameter Status

Field	Variable	Value	Description
1	DPARA(1,M)	+	Status of parameter at which corresponding diversion rate will be made corresponding to DF card. Each successive value must be larger than the previous one.
2	DPARA(2,M)	+	Second parameter status.

*Optional cards; however, if DS card is used DF and DP cards are also required.

* QD Card - Varying Desired Flows

This card specifies periodically varying minimum desired flows at this control point. If NPER is greater than 10, two cards are required.

Field	Variable	Value	Description
1-10	QMIN	+	Minimum desired flow in standard flow units (cfs or m^3/sec) unless nonstandard units have been specified by CMSTO (J2 card, field 6). Specify NPER (J5 card, field 1) values in successive order, one value per field. The first value must be the value for period number IPERA (J5 card, field 2).

* QR Card - Varying Required Flows

This card specifies minimum required flows at this control point. If NPER is greater than 10, two cards are required.

Field	Variable	Value	Description
1-10	QMIN2	+	Minimum required flow. Comments on units, number of values and order of values are same as for QMIN, above.

* QM Card - Maximum Permissible Flows

This card specifies maximum permissible flows at this control point. If NPER is greater than 10, two cards are required.

Field	Variable	Value	Description
1-10	QMX	+	Maximum permissible flow. Comments on units, number of values, and order of values are same as for QMIN (QD card).

*Optional card

D. Reservoir Subset (cards R1-RE)

R1 Card - First Reservoir Card

This card specifies some physical characteristics of a reservoir at this control point. Omit cards R1-PR if there is no reservoir at this control point; then the next card will be CP card for next control point, or ED card of this is the most downstream control point in the system.

Field	Variable	Value	Description
1	CEVAP	+	Ratio of net reservoir evaporation at this reservoir to index evaporation (J3, YE or EV cards).
2	STOR1	+	Initial storage in standard volume units (acre-feet or thousand cubic meters).
		-1	If this is a second set of data following a complete data set in which IUPDT (J3 card, field 4) was positive and if routing is to continue using ending storage from last period of prior routing, specify -1.
3	QLKG	+	Leakage through or under dam or powerhouse in standard flow units (cfs or m^3/sec). Normally only used to specify water which continuously passes the dam but cannot be used for power generation.
4	ISRCH	0	If zero or blank, no spillway surcharge allowed, and excess flood flows will be spilled when storage exceeds top of flood control pool (J1, field 3).
		+	Positive value allows spillway surcharge. The flood releases above top of flood control pool will be limited to the specified outflow capacity (RS and RQ cards).
5-10			Not used.

#Required for all reservoirs.

RL Card - Reservoir Target Levels

This set of cards specifies NL (J1 card, field 3) target storage levels for this reservoir. At least four levels are required. The lowest level is always the bottom of the conservation pool, and the second level is always the top of the buffer storage zone. If there is no buffer storage, target storages for levels 1 and 2 will be identical each period. The highest level (level NL) is always the full pool level (top of flood control). In conservation routings, the second highest level is always the top of the conservation pool. In a reservoir with no flood control storage the two highest levels will be identical for each period. For reservoirs with no active storage (such as run-of-river power projects) all levels will be identical for all periods. In the case of a run-of-river power project the storage value specified for all levels should be the storage corresponding to the pool elevation at which the average head can be developed. If more than one card is required to specify the storages at any one level, the values on the second card should start in field 5. The cards for each level can be read in any order. When cards are omitted for a given level, storages are assumed equal to the next lower level.

Field	Variable	Value	Description
1	L	+	Level number.
2	M	+	Control point number. Must correspond to M on CP card, field 1.
3	IRPT	0	Storages will be read for all periods. Two RL cards are required if NPER (J5 card, field 1) is greater than 6.
		-1	The STORL value specified in field 5 (multiplied by FACTR) will be repeated for the entire NPER periods. Only one card per level is required.
4	FACTR	0	Default value of 1.0 is assigned.
		+	Factor by which STORL will be multiplied.
5-10	STORL	+	Storage in acre-feet (or thousand cubic meters) for target level. Used to balance storage among reservoirs in supplying system water and power demands, Beginning with the lowest level, specify a storage value for each period until NPER (J5 card, field 1) values have been specified for that level. The first value, which will appear in field 5, must be the storage level for period number IPERA (J5 card, field 2). If more than six values are used, the remaining values start in field 5 of the following card. Fields 1 through 4 of the second RL cards of the same level are left blank.

#Required for all reservoirs.

RS Card[1] - Reservoir Storages

This card specifies the reservoir storage capacity table. As many as ten (limited by dimension) values may be used.

Field	Variable	Value	Description
1-10	STOR	+	Reservoir storage capacity in acre-feet (or thousand cubic meters). Specify up to ten values, beginning with the smallest value in field 1. Each value must be equal to or larger than the preceding one. The smallest value should be smaller than the storage for the lowest level, and the largest value should be as large or larger than the storage for the largest level. If ten values are not needed, the unneeded fields should be left blank. Since the program interpolates linearly in this table and in the tables on the RE, RA and RQ cards, and since the values on the RE, RA and RQ cards must correspond to the storage values on this card, the storage values should be selected so as to make linear interpolation relatively accurate between any two points on any of the four tables. Storage values should be selected to correspond with major discontinuities in any of the other three tables.

RA Card - Reservoir Areas

This card specifies the reservoir surface areas corresponding to the storage capacities specified on the RS card.

Field	Variable	Value	Description
1-10	AREA	+	Reservoir surface area in acres (or thousand square meters) corresponding to storage capacity in same field on the RS card.

#Required for all reservoirs.

[1]Cards RS-RE are entered as a set for each reservoir. All four cards are required for every reservoir. Each card in the set for a given reservoir must contain the same number of data items. However, it is not necessary to use the same number of data items for all reservoirs.

RQ Card - Reservoir Outlet Capacities

This card specifies reservoir outlet capacities corresponding to the storage capacities specified on the RS card.

Field	Variables	Value	Description
1-10	QCAP	+	Total reservoir outlet capacity (including conduits, turbines and spillways) in cfs (or m^3/sec) corresponding to storage capacity in same field on the RS card. Special care is needed to define this table properly to describe abrupt changes resulting at conduit inverts, changes in flow control and spillway crests.

RE Card - Reservoir Elevations

This card specifies the reservoir elevations corresponding to the storage capacities specified on the RS card.

Field	Variable	Value	Description
1-10	EL	+	Reservoir elevation in feet (or meters corresponding to storage capacity in same field on the RS card.

#Required for all reservoirs.

E. Power Subset (cards P1-PE)

P1 Card - First Power Card

This card specifies physical characteristics of a powerplant located at this control point. Omit cards P1-PR if no powerplant exists at this control point; next card will be CP card for next control point, or ED card if this is the most downstream control point.

Field	Variable	Value	Description
1	OVLOD	+	Overload ratio for the power installation. Usually 1.15 in the United States. If left blank, program assumes 1.15.
2	PWRMX	+	Installed powerplant nameplate capacity in kilowatts. Station service units are usually excluded.
3	TLWEL	+	Tailwater elevation plus hydraulic loss in feet (or meters). For hydroelectric projects providing "peaking" power, this should be a "block-loading" or average "on-line" tailwater elevation that would be expected normally during periods of power generation.
		0	Zero or blank indicates that a tailwater vs. reservoir release relationship will be read on the PQ and PT cards.
4	IDPR	0	Zero or blank indicates that there is no downstream reservoir whose elevation affects tailwater elevation at this powerplant.
		+	Control point number of downstream reservoir whose elevation affects tailwater elevation at this powerplant. Program adds 2.0 feet (.6 meters) for hydraulic loss to elevation of downstream reservoir to obtain tailwater elevation and uses that or TLWEL (field 1) depending on which is highest for computing power head.

##Required card for all reservoirs with powerplants.

P1 Card (continued)

Field	Variable	Value	Description
5	IPOW	0	Zero or blank specifies that power peaking capability function will not be used. This, in effect, means that the only limitation of power output will be the powerplant nameplate capacity.
		1	Value of 1 indicates that a peaking capability vs. reservoir storage relationship will be read in on cards PP and PS and used to calculate the turbine-generator capability as a function of reservoir storage. This option is used when head fluctuations are primarily dependent on headwater fluctuations.
		2	Value of 2 indicates that a peaking capability vs. reservoir release relationship will be read in on cards PP and PS and used to calculate the turbine-generator capability as a function of reservoir release. This option is used when the head fluctuations are primarily dependent on changes in tailwater.
6	EFFCY	0	Standard ratio of .86 is used.
		+	Powerplant efficiency at this installation expressed as a ratio. Specification of a positive value implies that efficiency is constant throughout the range of operating heads anticipated.
		-1	If -1 is specified, powerplant efficiency vs. reservoir storage relationship is specified on PE card.
		-2	If -2 is specified, KW/CFS (or KW/m^3sec) coefficient vs. reservoir storage relationship is specified on PE card.

P1 Card (continued)

Field	Variable	Value	Description
7	MPSYS	0	Zero or blank indicates that this powerplant does not function as part of a power system.
		+	Specify the power system number (1 or 2) for the power system in which this powerplant is to operate. As many as two power systems are permitted.
8	PFMAX	+	Maximum plant factor for generation from this project to contribute to meeting system power load. Must be equal to or less than OVLOD (field 1). Generation of rates greater than indicated by PFMAX will be permitted when excess water is available, but only the portion of generation up to PFMAX is considered to be useable in meeting the system load.
9-10			Not used.

PR Card - Energy Requirements (Card can be omitted if YP card is used each year for this reservoir.)

This card specifies the at-site energy requirements for this project for each period. If NPER (J5 card, field 1) is greater than 10, two cards are required.

Field	Variable	Value	Description
1-10	POWR	+	At-site energy requirement in thousand kwh. Specify NPER (J5 card, field 1) values in successive order, one value per field. The first value must be the value for period number IPERA (J5 card, field 2).
		-	At-site energy requirements as plant factor ratio times -1.0. Specify NPER values as above.

##Required for each powerplant.

* PQ Card[1] - Power Releases

Field	Variable	Value	Description
1-10	QT	+	Reservoir outflow in cfs (or m^3/sec). Begin with lowest value in field 1 and specify values in increasing order. Values should cover the range of discharges expected. Program uses linear interpolation between points, so values should be selected so that linear interpolation is reasonably accurate. If less than ten values are needed, the unneeded fields should be left blank.

* PT Card[1] - Power Tailwater

The number of values on this card must be the same as the number of values on the PQ card.

Field	Variable	Value	Description
1-10	TL	+	Tailwater elevation in feet (or meters) corresponding to reservoir outflow in same fields on the PQ card.

*Optional card

[1]Cards PQ and PT are used to specify the tailwater-discharge relationship at this powerplant instead of using TLWEL (P1 card, field 1). Up to ten values can be used to define the relationship.

PP
PS

* PP Card[1] - Power Peaking Capability

Field	Variable	Value	Description
1-10	PKPWR	+	Maximum peaking capability in kilowatts. Begin with smallest capability in first field and specify values in ascending order. Program uses linear interpolation in this table so values should be selected so that linear interpolation is reasonably accurate. If less than ten values are needed, the unneeded fields should be left blank.

* PS Card[1] - Power Storages (or Releases)

The data on this card can be either reservoir releases or reservoir storages. Reservoir storages are specified if IPOW (P1 card, field 5) is 1, and reservoir releases are specified if IPOW is 2. The number of values on this card must be the same as the number on the PP card. The largest should be larger than the highest storage or largest release anticipated and the smallest value should be smaller than the lowest storage or smallest release anticipated.

Field	Variable	Value	Description
1-10	CQOEL	+	Reservoir storage in acre-feet (or thousand cubic meters) if IPOW (P1 card, field 5) is 1, or reservoir release in cfs (or m^3/sec) if IPOW is 2. Values must correspond to peaking capabilities in same field on the PP card. Each succeeding value must be larger than the last value.

*Optional cards

[1]Cards PP and PS define the relationship between peaking capability and either reservoir storage or reservoir outflow. P1 card, field 5 must be equal to 1 or 2 to determine type of data being read. Up to ten values can be used to define the relationship.

* PE Card - Power Efficiencies vs. Storage

This card is used to specify the relationship between reservoir storage and either plant efficiency ratio or KW/CFS coefficient instead of using a fixed efficiency of EFFCY (P1 card, field 6). If EFFCY is specified as -1, plant efficiency ratios are specified on this card. If EFFCY is specified as -2, KW/CFS (or KW/m^3/sec) coefficients are specified. The number of values on this card must be the same as the number of values on the RS card.

Field	Variable	Value	Description
1-10	EFCY	+	Plant efficiency ratio if EFFCY (P1 card, field 6) is -1, or KW/CFS (or KW/m^3/sec) coefficient if EFFCY is -2. Values must correspond to storage capacities in same field on the RS card.

Repeat CP-PE cards for each control point in downstream order. ED card follows last control point.

F. End of Control Point Data

ED Card

Card with characters ED punched in columns 1 and 2 to end reading control point sequence cards CP-PE for last control point

*Optional card

G. Annual Data (Note Change in Format)[1]

** IN Card - Yearly Inflows

Inflow cards for each station specified on LF cards.

Field	Variable	Value	Description
1	M	+	Identification number of input inflows (columns 3-6). Must be less than 40.
2	IDT	+	Last 2 digits of year (columns 7 & 8).
3-14	QII	+	Inflows in units corresponding to CNSTI, NPER items per station (12 fields of 6 columns each, with first field in columns 9-14 on all cards).

* YE Card - Yearly Index Evaporation

New evaporation for each year to be applied to all reservoirs without EV cards.

Field	Variable	Value	Description
1			Not used (columns 3-6).
2	IDT	+	Last 2 digits of year (columns 7 & 8).
3-14	EVAPO	+	Net index evaporation in inches (mm) for each successive period, NPER items (12 fields of 6 columns each, with first field in columns 9-14 on all cards).

* Optional cards
**Required cards for all identification numbers that are referenced on the LF cards and those control points without LF cards. NYRS (J1, field 1) cards for each control point.

[1]Repeat cards IN-YL as required for each year (NYRS sets).

* EV Card

New evaporation for control point (reservoir) M for each year. The reservoir identification numbers must be in the same order as the reservoirs were entered as control points.

Field	Variable	Value	Description
1	M	+	Reservoir identification number (columns 3-6).
2	IDT	+	Last 2 digits of year (columns 7 & 8).
3-14	EVP	+	NPER values of evaporation in inches (mm) for reservoir M. (12 fields of 6 columns each, with first field in columns 9-14 on all cards.)

* YD Card

New diversion requirement for each year.

Field	Variable	Value	Description
1	M	+	Control point identification number (columns 3-6).
2	IDT	+	Last 2 digits of year (columns 7 & 8).
3-14	QDIV	+	Diversion, in units corresponding to CNSTO (J2 card, field 6), for each successive period, NPER values. (12 fields of 6 columns each, with first field in columns 9-14 of all cards.)

*Optional cards

* YP Card

New power requirement for each powerplant each year.

Field	Variable	Value	Description
1			Columns 3-6 not used.
2	IDT	+	Last 2 digits of year (columns 7 & 8).
3-14	POWR	+	Energy requirements for each successive period in thousand kilowatt-hours, NPER values.
		-	Plant factor ratio, NPER values (12 fields of 6 columns each, with first field in columns 9-14 for all cards).

* YS Card

New system power requirement for each year. One set per system.

Field	Variable	Value	Description
1			Columns 3-6 not used.
2	IDT	+	Last 2 digits of year (columns 7 & 8).
3-14	PWRS	+	System energy requirement in thousand kilowatt-hours, NPER values (12 fields of 6 columns each, with first field in columns 9-14 for all cards).

*Optional cards

* YQ Card

Desired low-flow requirement for each year.

Field	Variable	Value	Description
1	M	+	Control point identification number (columns 3-6).
2	IDT	+	Last 2 digits of year (columns 7 & 8).
3-14	QMIN	+	Minimum desired flow in units corresponding to CNSTO. NPER values (12 fields of 6 columns each, with first field in columns 9-14 for all cards).

* YL Card

New storage levels for each year. (Format is same as RL cards - fields of 8 columns.) The same number of levels must be supplied each year.

Field	Variable	Value	Description
1	L	+	Level number.
2	M	+	Control point number.
3	IRPT	-	Negative number indicates that the storage in field 5 is to be repeated for all periods.
4	FACTR	0	Default value of 1.0 is assigned.
		+	Factor by which STORL will be multiplied.
5-10	STORL	+	Storage in acre-feet (thousand cubic meters). NPER values, unless IRPT is negative in which case only one value is needed. When a second card is required skip the first 4 fields.

Repeat cards IN to YL as required for each year (NYRS sets).

*Optional cards

BN
BP

H. Benefit Evaluation Data

* BN Card - Benefit Names

Benefit function names (up to 60 characters). 8 cards using columns 3-62. Must be in order of identification in the 8 fields of each EC card.

* BP Card - Benefit - Parameters (fields of 8 columns except for field 1).

#Table of hydrologic parameter, flow in cfs (m^3/sec), storage in acre-feet (thousand cubic meters), or energy in thousand kilowatt-hours.

Field	Variable	Value	Description
0	MM	+	Benefit function number used only as identification (same as BV card, field 1) corresponding to field number of EC card for control point M. Ending in column 4.
1	M	+	Control point location where benefit is evaluated (ending in column 8).
2	MTH	+	Sequence number of last period where function is applicable (not necessarily calendar month number). Several sets of BP and BV cards can be used to cover the NPER periods. Ending in column 16.
3-10	HYVAL	+	First table value of hydrologic element in units corresponding to the MM field of the EC card for station M. Up to 8 table values (full card).

*Optional cards

#Table cards BP and BV must be supplied in pairs for each successive sequence period for all control points having positive indicator on EC card for each economic function in turn (all points for first function, followed by all points for second function, etc.). Pairs should be omitted if the function for the following period is identical, except that the pair for the last period must be supplied (normally MTH = 12).

<u>BV Card</u> - Benefit Values in Fields of Eight except for 1st Field

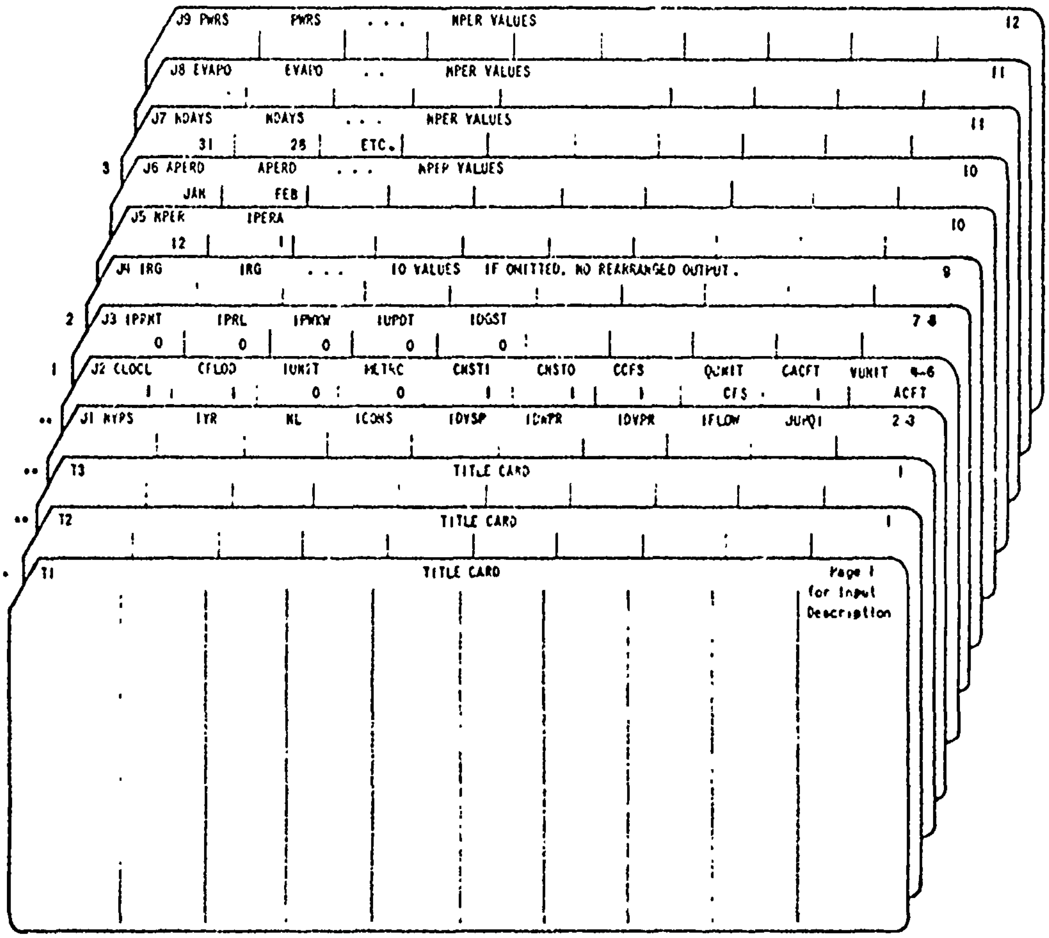
Table of benefit in thousand dollars (see example).

Field	Variable	Value	Description
0	MM	+	Benefit function number, used only as identification. Same as BP card, field 1. Ending in column 4.
1	M	+	Station number, must be identical to preceding card. Ending in column 8.
2	MTH	+	Sequence number, must be identical to preceding card. Ending in column 16.
3-10	ECVAL	+	Economic value in thousand dollars for corresponding hydrologic value on preceding card, etc., up to 8 table values.

I. End of Run

ER Card - ER punched in columns 1 and 2 should follow last job to cause computer to stop.

SUMMARY OF INPUT CARDS



NOTES:

** **Required cards
#Required for all reservoirs
##Required for all reservoirs with powerplants

1. Default values are shown below their respective variable names.
2. Cards without footnotes **, #, and ## are optional and can be omitted.
3. Columns 1 and 2 of J6 card are not reserved for identification.
4. Control Point cards (CP-PE) are repeated, as required, for each control point in turn in downstream order.
5. Reservoir cards (R1-RE) are used, as required, for all reservoirs.
6. Power cards (P1-P3) are used, as required, for all powerplants.
7. ED card follows cards CP-PE, as required, for last control point.
8. Annual data (cards IN-YL) are repeated, as required, for each year (NYRS sets).
9. Cards BP and BV must be supplied in pairs for each successive sequence month for all control points having positive indicator on EC card for each economic function in turn.
10. ER card should follow last job (T1-BV) to cause computer to stop.

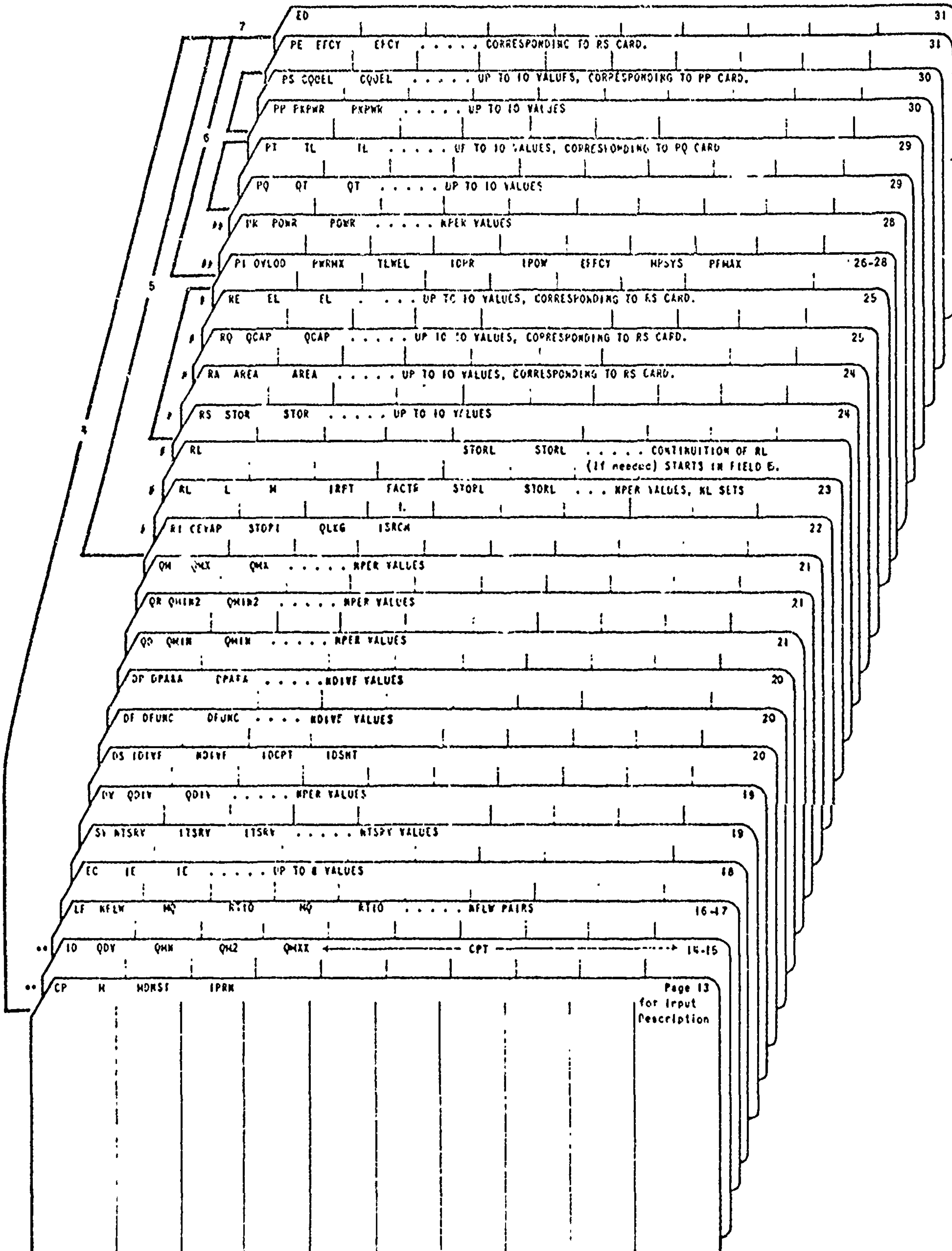


Exhibit 4
Page 40 of 41

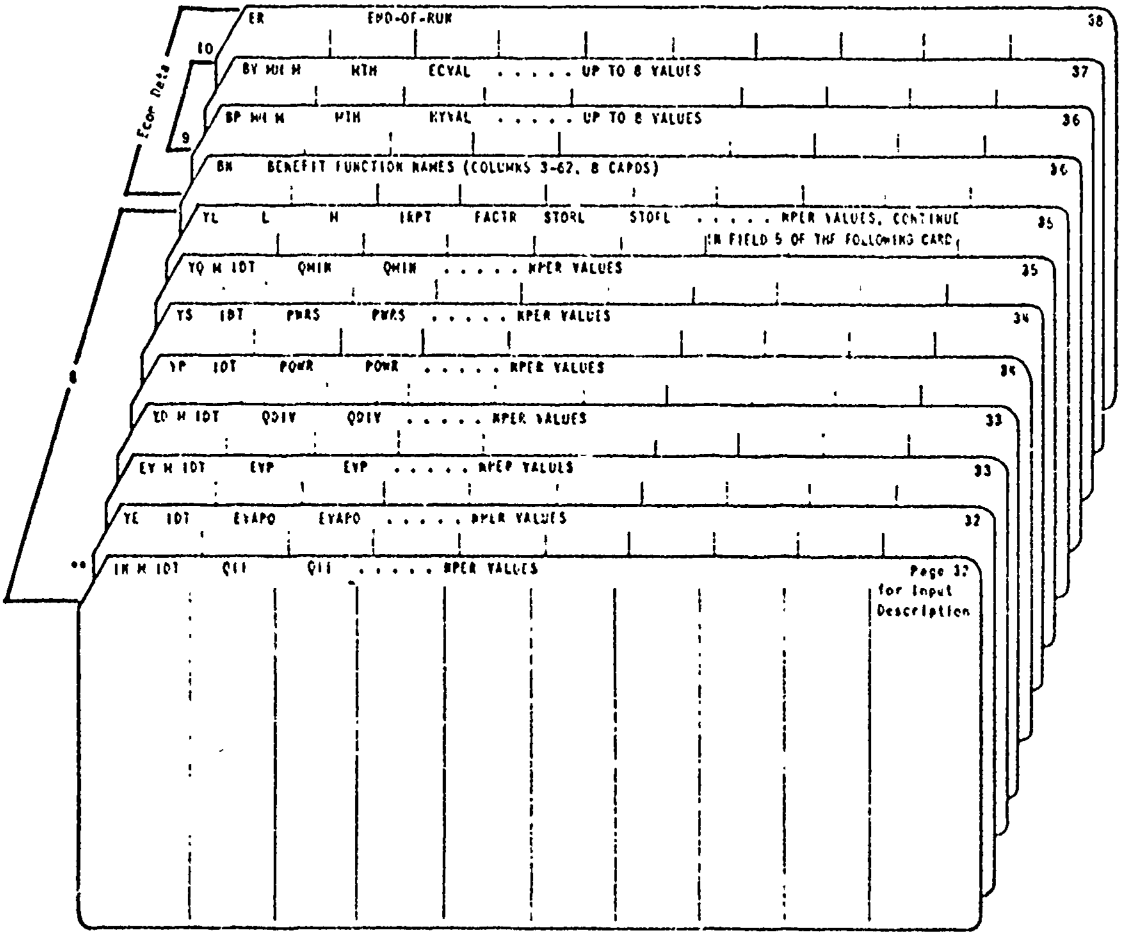


Exhibit 4
Page 41 of 41